Mushrooms and Toadstools

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Assistant Experimental Farmer
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W. S. Odell

28th Feb 1929

AMANITA MUSCARIA—FLY AGARIC

(DEADLY POISONOUS)

AMANITA PHALLOIDES—DEATH ANGEL

(DEADLY POISONOUS)

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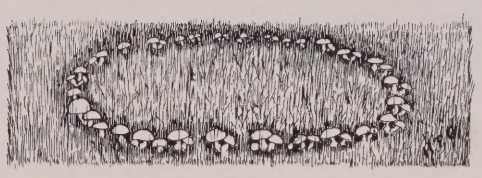
MUSHROOMS AND TOADSTOOLS

An Account of the More Common Edible and Poisonous Fungi of Canada

BY

H. T. GÜSSOW AND W. S. ODELL



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PREFACE

In response to the very numerous inquiries received during past years from interested students and correspondents, this account of common edible and poisonous fungi of Canada has been prepared.

While no attempt has been made to deal with all the higher fungi of Canada, few, if any, have been omitted that should be included among the commonest to be found throughout the Dominion.

The bulletin is not intended as a "learned treatise," but is meant to appeal to students as well as nature lovers, who wish to know the many odd or beautiful forms of fungous growth they may happen upon in their country rambles. In consequence, an arrangement has been followed not of a strictly scientific nature, but of a more or less alphabetical grouping, especially of the species mentioned herein.

My best thanks are due to my friend and collaborator, Mr. W. S. Odell, whose practical experience, together with the vast amount of material collected by him, has alone made this publication possible.

The excellent photographs were taken—unless otherwise indicated—by G. G. Clarke, Chief of the Photographic Division of the Geological Survey, from specimens collected by Mr. Odell on his frequent jaunts through woods and meadows.

For the use of Mr. Clarke's photographs in this publication the Department is indebted to the Victoria Memorial Museum officials, to whom we tender our grateful acknowledgments.

H. T. G.

OTTAWA, April, 1926.

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MUSHROOMS AND TOADSTOOLS

An Account of the More Common Edible and Poisonous Fungi of Canada

CHAPTER I

INTRODUCTION

The many inquiries which have been dealt with year after year by the Botanical Division relating to the determination of all kinds of fungi collected in the vicinity of Ottawa, as well as the steadily increasing number of specimens sent us by mail from many sections of the Dominion, suggested the preparation, on the occasion of the Central Canada Fair, annually held at Ottawa, of an exhibit of a number of common edible and poisonous fungi. The interest which this exhibit aroused surpassed all expectations, and for this reason it has been continued for some years. Later a similar exhibit was prepared for the Canadian National Exhibition at Toronto, with equal success.

As these exhibits continued to be visited by a large number of people, it became quite obvious that there existed a widespread interest in this subject. Mingled with this interest we often came across curious beliefs and the general distrust usually prevalent among the uninitiated regarding the edibility of these unusual plants.

The tendency of these days is to popularize science; hence, supported by the eager demands for reliable information, an attempt is hereby made to place in the hands of the general public this account of the most common edible and poisonous fungi occurring in Canada. To anticipate the critic it may at once be admitted that there exist in many regions east and west, other fungi that might have been included—and may yet be included, in a later edition, as our knowledge of them becomes more complete—but, for the time being, it is hoped that this account will serve as a field book on the subject to those already interested, and as an introduction for others to an acquaintance with fungi that will well reward their efforts.

There scarcely exists a more fascinating study in the realm of botany than is provided by the pursuit of the subject under discussion. There is at the same time hardly a subject about which distrust, superstition, and even dread are more rife. True, the daily press, by publishing from time to time in all their morbid details the fatalities following the eating of poisonous kinds, has done much to cause such feeling. Should we, however, succeed in dispelling these fears and throwing open to the great public a wide field of useful knowledge and recreation, our efforts will indeed be well rewarded.

In these pages, for instance, though we deal with one hundred and sixty species, only two are deadly poisonous. And these two offenders, the usual culprits in such fatalities, should be known to young and old throughout the length and breadth of our land.

Let us here state most emphatically that a knowledge of fungi is the only safe means of distinguishing edible fungi from poisonous. All so-called "tests" are myths and superstitious nonsense.

No claim is made in these pages to any new and original observations: the subject has been dealt with so frequently and often so admirably in the many textbooks already extant. Our intention is merely to provide a simple account to aid the student in distinguishing the bad from the good, the deadly from the harmless.

In order to achieve our purpose, may we now solicit the kind attention of our readers to the careful study of the fundamental introductory paragraphs. These, we trust, will be found interesting, even if we occasionally tax their patience and memory with the very few scientific terms which we found it necessary—though reluctantly—to employ.

"When Flora's lovelier tribes give place,
The Mushroom's scorn'd but curious race
Bestud the moist autumnal earth;
A quick but perishable birth,
Inlaid with many a brilliant die
Of Nature's high-wrought tapestry."

—*Bishop Mant.*

CHAPTER II

THE NATURE, GENERAL STRUCTURE, DEVELOPMENT, AND CLASSIFICATION OF FUNGI

The more elaborately "living things" are organized, the higher is the place they hold in any system of classification. Accordingly, man is regarded as the highest type of animal. The lower animals possess no specialized, intricate organization, and thus are popularly referred to as of low or lower rank. In the vegetable kingdom the same distinction rules. Thus we have higher plants—essentially so the flowering plants—in which the organs are more complex than in those groups possessing no flowers, correspondingly known as lower plants.

The term "fungus" (plural "fungi") designates a particular group of non-flowering plants, closely related to algae and lichens. Seaweeds of all types are algae. "Reindeer moss" is not a moss but a common species of the group of lichens. These plants differ from other non-flowering plants of a higher order, such as the ferns, in having no vascular system, i.e., an arrangement of spiral and similar vessels so prominent when the stem of a rhubarb leaf is torn in two. Furthermore, fungi contain no chlorophyll, which substance is responsible in other plants for their green colour. The term includes all species dealt with in these pages, edible or poisonous. Toadstools, popularly looked upon as poisonous, are fungi just the same as any other kind, though referred to under this name with the intention of distinguishing them from the edible kinds, popularly known as mushrooms. Unfortunately, the terms have no significance in distinguishing the good from the bad, the edible from the poisonous, even though this distinction is exceedingly common.

Owing to the lack of chlorophyll (which substance, aside from giving the green colour to plants, assists materially in the manufacture of plant food), fungi, generally speaking, depend for their growth and development upon food materials manufactured by the living plant. Thus dependent, their mode of life is that of a parasite, like the rusts, smuts, and other fungi; or they may find their food requirements in dead organic matter, when their mode of life is termed "saprophytic."

Fungi do not produce roots as do higher plants, nor flowers, nor seeds. The vegetative functions are performed by what may be popularly likened to a system of roots, viz. the mycelium, which, if prominent to the naked eye, is referred to as "spawn." The mycelium is a dense network of fine, microscopically minute, frequently partitioned, hair-like tubes or hyphae (Pls. 3[5]; 4[a]). The mycelium or spawn possesses regenerative power; small portions may be used for propagation, as is the case in the artificial culture of the table mushroom.

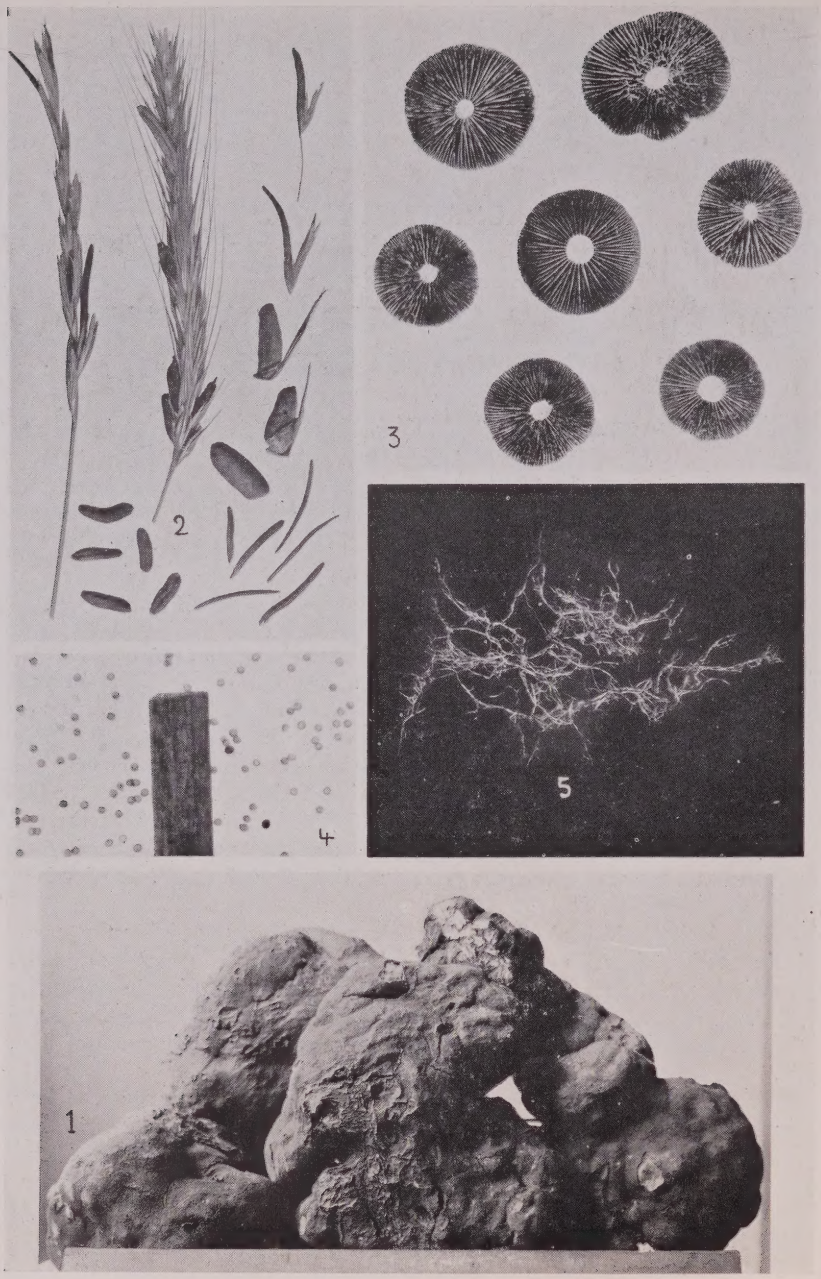


Fig. 1. Large underground sclerotia of a polypore. *(Photos. 1-4, H. T. Cüssow)*
2. Sclerotia known as "ergot" grains of various grasses.
3. A series of spore prints, photographed from nature.
4. Fungus spores and human hair, same magnification.
5. Mycelium of a fungus, natural size.

The true reproductive organs of a fungus are known as "spores" (Pl. 4 [c-k]). Inasmuch as spores are able to germinate (Pl. 4 [l-o]), they are often likened to seeds, but a true seed is much more highly organized, containing the well-defined embryo or young plant, surrounded or furnished with a supply of food for the use of this young plant when it develops (Pl. 4[b]).

Fungi differ materially in size and structure; they may be microscopic or very minute in size, or they may present themselves as very formidable objects. Thus our collection at Ottawa contains some woody or bracket fungi (*Canoderma applanatum*) twelve by twenty-four inches in size, as well as at least one giant puffball more than three times the size of a football.

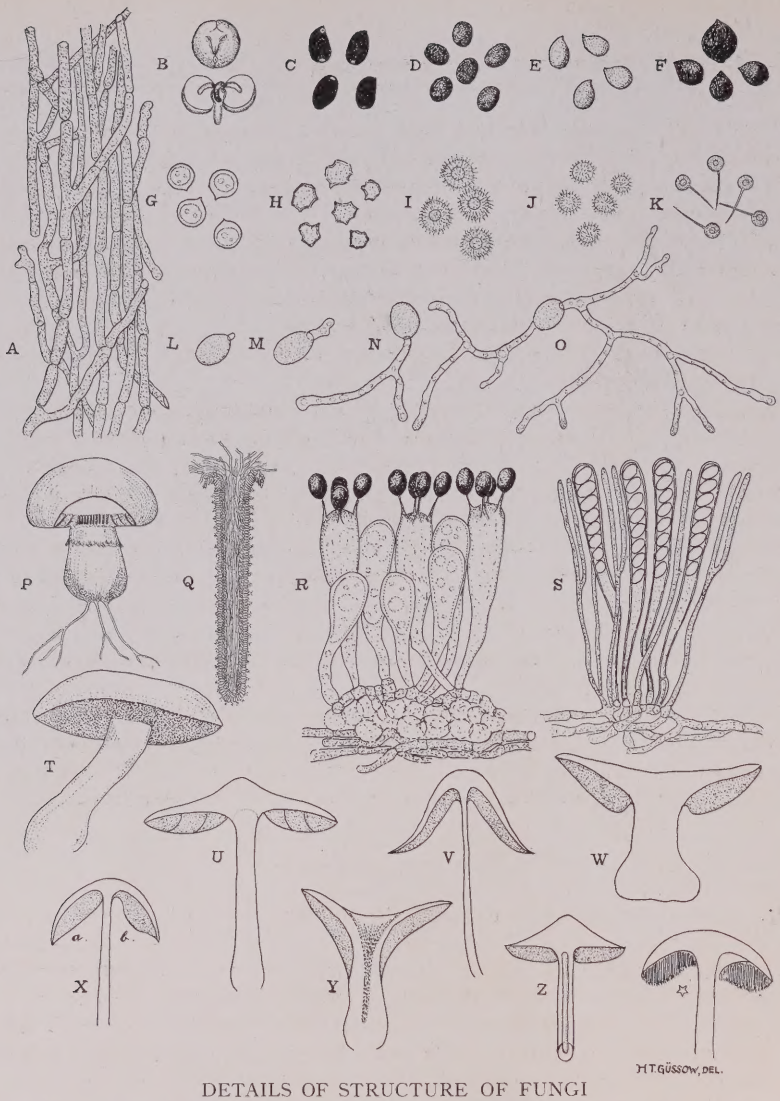
In structure the smallest forms are most wonderful, beautiful, and interesting objects for microscopical study; and their organization, structure, and precise functions bear remarkable testimony to the Creator's wondrous skill. Their variations in colour alone defy all attempts at classifying them or describing the marvellous tints that may be met with. The fungus spores themselves often show most beautiful markings, shape, and form, even though they are so minute in size. Many fungus spores are so small that a good many may be placed side by side to make up the breadth of a human hair (Pl. 3[4]).

The spore is the reproductive organ. Besides, there occurs vegetative reproduction by mycelium directly, or by superficial or submerged masses of specialized hyphae known as "sclerotia." One of the latter, incidentally the largest kind occurring in Western Canada, forms a buried, black, hard body, many pounds in weight (Pl. 3[1]). The so-called "ergot grains" constitute another example of sclerotium, produced in this case in the ears of rye, wheat and other grasses by a parasitic fungus (Pl. 3[2]).

Knowing nothing of the structure of fungi it would prove difficult to attempt the classification of the many thousands of forms, or to determine the position in any system of classification of a single specimen under study.

For this purpose it is desirable to briefly review the life-history of a fungus, that is to say, to observe all phases and changes that occur from the commencement of the germinating spore to the production of a new generation of spores. It would be a difficult task in a popular account, and altogether too complicated, to deal with the many deviations that occur in individual genera from the simple developments here described. The mature spore of a mushroom, finding conditions suitable for growth, absorbs moisture and increases in size. Eventually its cell wall or covering membrane ruptures or is pierced from within by the germ tube—the first sign of germination—which later branches and continues to branch freely until the substratum or matter upon which it grows is permeated in all directions by a dense network of hyphae, collectively referred to as "mycelium." This mycelium absorbs nutriments, and thus functions similarly to the root-system of flowering plants.

The production of spores in nature from a single mushroom amounts to millions. On germination of so many spores within a small space, the mycelia of these spores frequently unite by fusion, eventually giving rise to one or more fruiting bodies. At first there become visible to the naked eye dense masses of hyphae, forming gradually into small nodules, increasing until they resemble a pea in size and shape, and finally growing into the so-called "button" stage, so often referred to in the literature dealing with the development of mushrooms. The button expands, and the perfect fungus results (Pl. 14), which soon teems with a new generation of spores, to continue its life-cycle as described.



DETAILS OF STRUCTURE OF FUNGI

(A) Mushroom "spawn" or mycelium, much enlarged, showing single "threads" or hyphae. (B) Seed of garden pea and same opened, showing young plant and rootlet. (C) to (K) Spores of various fungi uniformly enlarged—(C) Coprinus, (D) Psalliota, (E) Pluteus, (F) Panaeolus, (G) Amanita, (H) Entoloma, (I) Clitocybe, (J) Lactarius, (K) Lycoperdon. (L) to (O) Germination of fungus spore—(L) after six hours, (M) after eight hours, (N) after twelve hours, (O) after twenty-four hours. (P) Type of gill-bearing mushroom, showing cap, stem with ring, and strands of spawn at base. A small section is cut off the cap showing the gills. (Q) Section through one of the gills highly magnified, the external surface closely lined with spore-bearing basidia. (R) Three basidia and a number of immature and sterile cells from the hymenium of a Basidiomycete very highly magnified, showing spores borne on fine, hair-like tips. (S) Portion of the fruiting layer (hymenium) of an ascomycetous fungus. Spores eight in number, arranged chain-like in small tubes or asci. (T) Type of pore fungus, lower surface of cap showing innumerable perforations or pores. (U) to (Z) Types of gill-attachment to stem. (U) Gills free from stem. Incidentally note stem separate from cap, which is umbonate, *i.e.* raised in the centre. (V) "Decurrent with tooth." Note small, sharp "tooth" of gills against the stem. (W) Gills sinuate (rounded behind). Stem not separate from cap. (X) Gills adnexed, a—even, b—ventricose. (Y) Gills decurrent. Cap showing funnel-shape. (Z) Gills adnate, stem hollow. * Section through pore fungus, at right showing easy detachment of pore layer from cap.

The perfect fungus is really a fruiting body varying in shape and structure, carrying the spores in some manner or other; hence technically spoken of as a "sporophore." On frequent occasions the immediate surroundings of a mature sporophore will be found covered with a dense deposit of fungus spores, covering the ground, leaves, blades of grasses, etc., with a fine white or variously coloured dust. The mechanism of spore dispersal and the methods of their general dissemination in nature are most interesting phases to observe, and those interested in a closer study of these remarkable plants are referred to our list of suitable works from which they may gather additional and more precise information.

The manner or mode of production of spores is, broadly speaking, used as a fundamental basis for the classification of fungi.

Among the larger fungi, to which the pages of this account are confined, we may observe two fundamental methods of spore production, which affords an opportunity of establishing two main groups. In the first, the spores—usually four in number—are produced by special cells, forming a dense layer, the fruiting layer, or, technically, hymenium (Pl. 4 $^{r-s}$). Individually the spore-bearing cell is known as "basidium" (plural "basidia"). All basidia are microscopic in size and cannot be seen with the naked eye. We refer our readers, in order to familiarize them with their appearance, to plate 4^{r} of our explanatory sketches. Usually they are more or less club-shaped, colourless cells, bearing a number of fine, delicate points at the apex, corresponding to the number of spores produced at the tips. These spores are known as "basidio spores," being borne by a basidium. From this characteristic, this first group of fungi is known as "BASIDIOMYCETES" or "Basidio-fungi."

The second main group exhibits an entirely different method of spore production. Here the spores, however produced, are without exception contained singly or in odd or even numbers, usually eight, in special spore cases or sacs (Pl. 4^{s}). Technically this sac is known as an "ascus"; hence this group has received the designation of "ASCOMYCETES" or "Asco-fungi."

FIRST MAIN GROUP

BASIDIOMYCETES

In this large main group the spore-bearing cells occur either in continuous superficial layers, covering the surface of "gills," or knife-like folds, or lining the interior surface of pores, or they occur (to the naked eye in apparently structureless masses) in special containers. The position of the fruiting layer enables us to further subdivide the fungi dealt with in this bulletin.

Thus, in far the largest order of our fungi (first subgroup) the spore-bearing layer is naked, that is, freely exposed to the air and not covered by, or enclosed within a membrane or special container. This order is known as the "HYMENOMYCETES," and includes all forms where the spores are borne on basidia, densely covering the surface of radiating, knife-like folds or gills (gill fungi) (Pl. 14), or lining the inside of pores or tubes (pore fungi) (Pls. 4t; 91), or they may cover prickly, teeth-like organs (teeth-bearing fungi) (Pls. 103; 104), or are produced on simple club or coral-like formations (coral fungi) (Pl. 106).

Two other subdivisions, one of which is not included in our bulletin, since it contains no specimens of special interest to us, may be mentioned for the sake of accuracy and completeness.

In one the spore layer is spread over the smooth, often wrinkled surface of peculiar, soft, moist, and jelly-like fruiting bodies (jelly fungi) (Pl. 108). The other and last subdivision includes the leathery, smooth, corrugated, or lobed fruiting forms so commonly found on old logs or stumps, generally referred to as "leathery fungi."

In the second subgroup the spores are not exposed to the air; they are most commonly contained in flask-shaped or globular bodies, which remain wholly intact until maturity, when the covering walls burst or open at the apex with a more or less definite hole, and spore dispersal takes place. Owing to their general shape—the puffballs belong to this group—they are readily recognized. In some forms the receptacle is much like a stem in appearance. This group is known as "GASTEROMYCETES."

It would save much time and confusion, besides being more concise and definite, if the reader would remember the technical terms so essential in the classification of fungi, together with their distinctive characters, viz. the two main groups, BASIDIOMYCETES and ASCOMYCETES, the former of which, we have seen, is subdivided into HYMENOMYCETES and GASTEROMYCETES. The common ending "mycetes," it may be explained, is a modified Greek word meaning fungus.

It might also be pointed out here that few fungi have a popular, but all have a scientific, name, consisting of two latin words. The first of these denotes the generic name and corresponds to the family or surname of a person; for instance, Smith. The second—specific—name corresponds to the Christian name; for instance, John. Just as every child of the Smith family bears its specific or individual name, so all species of a genus of fungi bear their specific or individual name, for instance, *Coprinus*—the generic name—with *atramentarius*, *comatus*, *micaceus*, the individual names of three species. The name is given by the person who described the fungus. According to the rules of botanical nomenclature, this person has the right to add his own name, generally in an abbreviated form, viz. *Coprinus atramentarius* Bull., this species having been named by Pierre Bulliard, a famous French mycologist, and author of the Herbier de la France; Histoire des champignons.

FIRST SUBGROUP

HYMENOMYCETES

We must now briefly review the general structure of this group, when it will become evident that astounding variations exist.

To repeat, the fruiting layer in this group, technically referred to as "hymenium," is naked, that is to say, the spores are exposed to the air without any covering whatsoever.

Attention has been called to the exceedingly small and microscopic size of fungus spores generally. The structure of the hymenium, as well, is microscopic in size. We therefore refer our readers here to the detailed sketches of the arrangement and structure of the various groups to be found on plate 4. From these will be readily gathered the characters referred to in this discussion; and it is suggested, for a more clear and easy understanding of the same, to occasionally refer to these figures, when, together with this description, we hope the subject matter will be quite clear.

The question now arises of arranging this comprehensive and formidable group into definite divisions, so essential in determining the position of any specimen in this system of classification, with which we desire our readers to become familiar.

Let us examine, for example, a specimen of the common mushroom. It consists of two prominent features, viz. the cap (pileus), and the stalk, stipe, or stem. These features are common to all umbrella-shaped forms (Pl. 4^t).

The cap is the expanded, fleshy part, and though common to all, may vary considerably in size, shape, and colour. There are a number of specific terms used in describing these characters of the cap, which will be discussed later. At present we wish to examine the cap for the presence and location of the hymenium only. On turning the specimen upside down, we find the lower surface of the cap remarkably different from the upper. The numerous, radiating, knife-like, "edge up" folds, or, correctly speaking, gills (Pls. 4^q; 17^x), are most conspicuous. Let us now break the cap in halves. Immediately we are able to distinguish a pronounced difference in texture between the upper and the lower surface portions of the cap. This difference is due in the mature specimen to the presence of the fruiting layer. This layer may either be readily removable from the rest of the cap, or it may be firmly united with, yet quite distinct in texture from the flesh of the cap. Having now located the position of the fruiting portion, we proceed to examine the superficial structure of prominently differing types.

1. The radiating folds issuing from the centre are the gills or lamellae. These are covered with the hymenium, composed of the spore-bearing cells (Basidia) (Pl. 4^r).

2. The hymenium in other forms may be composed of a dense, continuous layer, showing innumerable perforations or smaller or larger, round, oval, or irregular holes. These are referred to as tubes or pores (Pls. 4^t; 91), the inner walls of which are lined with the basidia.

3. The hymenium may appear in the cap of some forms almost continuous with the texture of it, no definite line of demarcation being visible in breaking it in halves. Yet it is most prominent in shape of the large number of prickles or teeth, which are covered all over the surface with the spore-bearing cells (teeth fungi) (Pls. 103; 104).

We are now in a position to distinguish readily gill fungi, pore fungi, and teeth fungi.

In addition to these prominent sections, we may here mention certain types which differ so markedly from the ordinary umbrella type, that by their appearance alone they are readily recognized. We have in mind the club or coral fungi (Pl. 106).

Finally there are the jelly and leathery fungi, two groups of little importance from the collector's point of view.

To recapitulate: The HYMENOMYCETES, dealt with in our account, have been divided into the six principal types discussed, viz. gill fungi, pore fungi, teeth fungi, club or coral fungi, jelly fungi, and leathery fungi.

It will be clear, we hope, from our remarks that the grouping of fungi is no more difficult than that of higher plants; and it is just as easy to gain a fairly sound knowledge of them as of birds.

Since there exist vast numbers of gill fungi, we require to devote some attention to their classification.

First Division

GILL FUNGI

Before studying, however, any other characters of the species in this group, we must determine the spore colour of any specimen under observation. The colour of the gills themselves is no indication of the colour of the spores borne by them. Neither is the colour of the spores viewed under the microscope of much significance. Similarly, a drop of blood examined under the microscope will not appear blood-red in colour. What is meant by the determination of the spore colour is the colour of the spores *en masse*. There is a very easy and fascinating method, viz. the making of a spore print.

For this purpose, cut away the cap from the stem immediately below the gills. The more perfect the specimen selected, and the more care taken, the more beautiful and complete will be the resulting spore print. Of course, even a small portion of the cap will yield a print satisfactory enough for the determination of the spore colour. Place the cap, lower surface down, upon a small piece of unglazed, thin, white or blue paper. If doubtful as to the colour of spores, make a print on both kinds of paper. This is especially recommended when one specimen only is available. Cover the cap with a tumbler or bell-jar, and allow to remain undisturbed for a time, when a beautifully shaped deposit will appear on the paper (Pl. 3[3]), corresponding to the arrangement of the gills and showing unmistakably the colour of the spore mass.[1]

According to the colour of the spores so determined, we classify gill fungi into five groups, viz.: white, pink, brown, purple, and black-spored.

From the dense deposit of spores so obtained, it may be gathered that they are produced in enormous numbers. Indeed, many "prints" may be secured from a specimen in good condition. By means of the most wonderful natural principles of engineering, these spores are discharged one or thousands at a time without touching or interfering with each other. The method or mechanism of spore discharge is a secret of nature which one may learn only after years of patient study and observation. The spores are shot into the air and are, generally speaking, dispersed by air currents.

Many fungi retain their capacity of producing spores even though they may have been dried for many months. When revived, by being gently moistened on their upper surface, they will soon commence again to discharge even viable spores.

After having made spore prints for our amusement from as many different types of fungi as possible, we are at once struck by the fact that a good many obviously different forms yet produce spore prints of the same colour. This is a fact which at once gives rise to the question, "How may those of identical spore colour be further distinguished?" Spore prints alone do not suffice. We must continue our studies and look for additional characters exhibited by such fungi in order to more critically determine them. Such characters may be recognized in the cap itself, in the gills, or in the stem, singly or collectively.

[1] It may be desirable to preserve such spore prints for future reference, in which case they should be "fixed," otherwise the deposit is easily wiped off and spoiled. For this purpose, dissolve as much pure, clean rosin in wood alcohol as the latter will take up. For use dilute this "stock solution" with wood alcohol and proceed with the fixing, or rendering more permanent, the spore print, by brushing some of the diluted solution against the back of the paper opposite to the position of the spore print. The solution will quickly soak through the paper and glue the deposit into position, without interfering with the original arrangement or colour of the print.

To begin with, the cap varies in colour, yet the colour may vary so considerably within a species, according to age and condition or place of growth, that it does not always afford conclusive proof of its identity. The cap may show other characters which should be carefully observed. If centrally deeply depressed like a funnel, it is termed "funnel-shaped" (infundibulate) (Pls. 4^{v}; 22^{2}); when slightly depressed in the centre it is umbilicate (Pl. 52); or umbonate when centrally elevated (Pls. 4^{u}; 12); convex when curved downwards; concave when the margin turns upward in a saucer-like fashion; plane when even and straight. The margin of the cap may be thin or thick, hairy or bearing appendages; it may be reflexed or turned up; involute or rolled up inward; repand, when wavy; striate when marked with lines corresponding to the gills below. The upper surface of the cap may be smooth, velvety, shiny, dry, sticky, glued, or covered with tufts or scales, or marked with concentric rings, etc., etc.

The gills also show remarkable variation. Their own colour is fairly constant, and certainly does not vary within the species nearly as much as the colour of the cap. They, therefore, constitute a valuable aid to identification. But it is principally the relation of the gills to the stem which must be observed, since this feature, being very constant, affords additional help in determining a fungus of the gill-bearing type. The gills may thus be quite free from, or may be squarely joined to the stem (adnate); or they may only partly join the stem (adnexed); they may continue down the stem for a distance (decurrent); they may be notched, wavy, waxy, forked, etc., etc. (Pl. 4^{u-z}).

Certain HYMENOMYCETES exude a milky juice when injured. To determine this, use a needle and slightly scratch the surface of the gills or any other portion of the fungus. It is important to observe the colour of the fresh milk, as well as any change in colour of this juice on exposure to the air.

The stipe or stem also exhibits valuable diagnostic features. It may be central or excentric, long or short, stuffed or hollow, easily detachable from the cap by a gentle screwing motion or continuous with it. It may show club-like enlargement at the base or have a pronounced bulb several times the thickness of the rest of the stem. This feature is one of the most significant in distinguishing most poisonous forms. There may occur a long taper at the base resembling a tap-root, which character will distinguish certain fungi almost at once.

Before leaving the section dealing with the stem, attention is directed to the great importance attaching to an examination of a complete stem. Without the stem characteristics a large number of fungi cannot be definitely determined, among them our most deadly poisonous forms. Collectors of unknown forms should lift out a fungus carefully to keep the stem and its base fully intact.

In the case of the common mushroom, we have explained that the sporophore arises from a small button-shaped mass of mycelium or spawn. We have emphasized the importance of examining a whole or complete stem, since, according to the kind of fungus, the stem exhibits often very important features. In the very earliest stages one can distinguish in section of the small button referred to, a separation into cap and stem. Whenever one comes across this early stage, a careful study should be made, as it will enable us to determine and comprehend the origin of the various and important features now described.

In some fungi the young forms are enveloped in a fairly stout covering as an eggshell covers an egg, but thicker and spongy in texture. From this stage future growth is made by two different

methods. In the first—in the common mushroom among many others—this outer covering, known as the "veil," remains in contact with the stem. Even though the stem elongates, the cap still remains fairly unexpanded for a time, and will be found to be covered, including the gills, by this shell-like membrane. Eventually the cap expands, the veil stretches still across the gills, but is finally ruptured, and part of it may adhere in irregular masses to the margin of the cap, forming the appendages described under the section of cap margins, while the remainder of the tissue forming the veil surrounds the stem in the form of a ring or annulus, often movable up and down, and rather perishable in some species.

In the second type of development from the button stage, we find almost exactly the same origin of veil and ring, but in addition there exists a most important feature that is significant in most of our poisonous kinds, and hence deserves the utmost attention. In these and related forms, the button stage remains covered with the outer membrane, and as it grows in height the covering, technically known as "volva," is partly torn away from the bulbous base of the stem, often leaving on its surface pronounced concentric ridges, or forming with its lower half a more or less prominent cup, from the centre of which arises the stem with its veil exactly similar to that of the common mushroom and related types. But so tough is this veil in some species that it ruptures around the margin of the cap and adheres as a very prominent collar to the stem, forming a far more prominent and less perishable ring than is the case in any other type of mushroom. The volva should be carefully studied. Its presence, together with the prominent ring and white gills, are the most reliable features common to all the poisonous forms described in this bulletin. Often very prominent in its cup formation around the swollen base, this feature does not always persist once the fungus has reached over-maturity, or during hot and dry weather. In some cases only an experienced student will recognize the remnants of the volva. Fortunately, there are other characters in addition to the volva and arising from it, that aid in the recognition of the species.

It has been mentioned that the volva covers the entire button stage and is torn away from the margin of the cap, leaving the small cap still covered on its surface with the upper half of the volva. The lower half, we remember, formed the cup. As the cap or pileus expands—and this often with surprising energy—the tissues of the volva not capable evidently of expanding correspondingly with the cap, are torn into smaller or larger fragments and adhere as flakes or tufts to the surface of the cap, standing out prominently as raised, white or creamy patches against whatever colour the rest of the cap may finally assume. We recommend a very close study of the subject of veil and volva, and request that the student make frequent reference to the illustrations of fungi showing this important feature (Pls. 5; 6; 7).

In other fungi, neither veil and annulus, nor volva are ever formed, while in others only a very rudimentary veil exists, made up of a web of strands of more or less loose, cobwebby or fibrous nature, usually present only in very young stages (*Cortinarius*, etc., Pl. 73[2]).

Second Division

PORE FUNGI

It is easy to distinguish pore-bearing fungi from all others. An examination of the peculiar perforated fruiting layer will at once enable anyone to recognize them. There occur numerous genera, with many species in Canada; and some simple method of classifying these is decidedly

necessary. For our purposes we distinguish fleshy forms, resembling or not resembling in shape the common mushroom. The remainder are corky, woody, soft at first and hardening with age, or dry, leathery, though often remarkably beautifully marked and coloured. The fleshy forms are generally growing on the ground; the woody are found on wood or frequently form bracket or shelf-shapes, such familiar objects at any time of the year on stumps or trunks of living or dead trees. Another group is rather inconspicuous, covering the surface of fallen logs, twigs, or branches with a thin, sombre or brightly coloured coating formed by the hymenium.

Third Division
TEETH-BEARING FUNGI

Fourth Division
CLUB AND CORAL FUNGI

Fifth Division
JELLY FUNGI

The popular names given to these divisions describe their diagnostic characters so well that it is hardly necessary for our purpose to enlarge upon their classification here. Only a very few of these forms are mentioned. If a fungus is found showing the principal features, viz. teeth or slender spines on the lower surface, or club or coral-like in shape, or jelly-like to the touch, it will be sufficient to consult the descriptions of these forms given in Chapter V to accurately determine them. The club and coral fungi are all edible. One species of the jelly fungi is referred to merely for the sake of information. The sixth group, leathery fungi, are not dealt with.

These remarks conclude our chapter on HYMENOMYCETES of interest to us.

SECOND SUBGROUP

GASTEROMYCETES

(Pls. 109; 111; 113, etc.)

Several genera of this group exhibit a stem-like fruiting body, terminating at its apex in a cone or bell-shaped cap or tip, covered at maturity with a slimy, deliquescing substance in which the spores are produced. These forms all arise from a definite egg-stage composed of several layers, the middle one gelatinous. Later they bear a volva at the base of the stem. Neither in these nor in any of the following, is there a fruiting layer resembling anything met with before. Indeed, in the latter forms no fruiting layer of any kind is visible externally. The commonest forms of this group are globular, flask or pear-shaped, solid, fleshy balls of various sizes and dimensions, popularly known as "puffballs." The solid, fleshy interior gradually changes into a spore-filled, dry ball, correctly termed puffball, because at the least touch "puffs" of spores will be discharged either through a round or lacerated hole at the apex or through fissures and ruptures of the covering walls. In several genera the outer walls break into segments, which open out and form a star-shape on the ground. These are popularly known as "earth stars." The common "bird-nest" fungi also form a division of this group.

The student will encounter no serious difficulties in recognizing these fungi, because of their very characteristic forms. Some of them are exceedingly beautiful, though very objectionable because of their offensive odour, viz. the repugnant and yet so interesting forms known as "stinkhorn" fungi. All the puffballs are edible.

With this brief discussion we may now turn our attention to the

SECOND MAIN GROUP

ASCOMYCETES

(Pl. 120-127)

In this large group of fungi the spores are arranged within microscopically-small sacs or asci (Pl. 4[s]), and usually such determination precedes any further study. Since these characters are visible only under the microscope, and since other characters are very prominent, it is preferable for our purpose to attempt an arrangement according to features not requiring the use of a microscope. Extraordinary variations occur among the members of this group, as well as within individual specimens. One feature is very certain—they never possess anything like gills or pores, nor will they be mistaken for any member of the GASTEROMYCETES, even though the well-known European truffle resembles a ball in shape. It is, however, quite distinct, always being found below the ground level, and rather hard, rubbery, and coal black. The truffle does not occur in Canada. By far the greatest number of ASCOMYCETES are of microscopic size.

The forms dealt with in this treatise are grouped into plants with prominently pitted or gnarled caps, or plants with saddle-shaped, lobed caps, and finally into saucer, cup, or goblet-shaped plants. Some forms not specially mentioned are typically club-shaped.

The species dealt with, when found, are recognized at a glance by the illustrations, and since only very few are ordinarily used for the table, the beginner is not likely to encounter any difficulties.

This concludes our introductory chapter. If we have succeeded in making ourselves quite clear to the layman, and also arousing his interest, our efforts are indeed highly rewarded.

CHAPTER III

GUIDE TO THE GENERA OF FUNGI DISCUSSED

In the following outline an endeavour is made to review the information contained in the foregoing chapter and to summarize in a more lucid manner the general classification of fungi, especially those dealt with in the following pages. In an extensive treatise this feature would be dealt with by a so-called "key," but in a restricted account it is impossible and even undesirable to employ this method, because it is bound to be misleading.

We admit at once the liberty which we have taken with our readers—and pray their forgiveness—in employing in our main division of all fungi the terms "Basidiomycetes" and "Ascomycetes." While scientifically no objection may be raised, yet the determination of the characters underlying the establishment of these two main groups is essentially microscopic. Microscopic, inasmuch as the basidia of the first and the asci of the latter group cannot be seen by the naked eye. It is well, however, to know that all the higher fungi may be classified into these two groups.

The fungi described in this treatise have been divided as follows:—

FIRST MAIN GROUP

BASIDIOMYCETES

			PAGE
First subgroup:	Fruiting layers exposed to the air	HYMENOMYCETES	18
Second subgroup:	Fruiting layers not exposed to the air	GASTEROMYCETES	23

FIRST SUBGROUP

HYMENOMYCETES

First division:	Fungi with gills	Gill Fungi	20
Second division:	Fungi with tubes or pores	Pore Fungi	22
Third division:	Fungi without gills or pores, but with prickles or teeth	Teeth Fungi	23
Fourth division:	Fungi without gills, pores, or teeth; club or coral-like in shape	Club or Coral Fungi	23
Fifth division:	Fungi without gills, pores or teeth; forming soft, jelly-like masses when moist	Jelly Fungi	23

First Division

GILL FUNGI

The spore colour should be first determined. According to the colour of the spores the genera of the gill fungi are separated into the following colour groups or subdivisions: A. white, B. pink, C. brown, D. purple, and E. black.

SUBDIVISION A

White-spored Genera

		PAGE
I. Plants fleshy to firm, never leathery—		
(*a*) Stem easily separating from cap—		
1. With volva and ring	Amanita	32
With volva, ring absent	Amanitopsis	38
2. Volva absent, ring present	Lepiota	38
(*b*) Stem continuous with cap, of same texture—		
1. Stem central—		
a. Ring present	Armillaria	50
b. Ring absent—		
Gills notched or sinuate	Tricholoma	53
Gills decurrent, sharp edged, rarely adnate	Clitocybe	58
Gills decurrent, blunt edged, stem often lateral	Cantharellus	70
Gills decurrent or adnate, plants with milky juice	Lactarius	74
Gills adnate, brittle, without milky juice	Russula	84
Gills adnate to decurrent, waxy at maturity, without milky juice	Hygrophorus	99
2. Stem lateral or absent; rarely central; on tree trunks	Pleurotus	104
(*c*) Stem continuous with cap, but of different texture—		
Gills adnexed to sinuate	Collybia	110
Gills decurrent	Omphalia	116
Gills adnate to sinuate	Mycena	118
II. Plants tough, more or less leathery—		
Stem central; very tough; different in texture from cap; gills free; plants growing in grass	Marasmius	120
Stem lateral to central, continuous with cap, same texture; margins serrate; on wood	Lentinus	122
Stem excentric; continuous with cap, same texture; margins incurved; on wood	Panus	126

SUBDIVISION B

Pink-spored Genera

I. Stem central—		
(*a*) Not continuous with cap; easily separated—		
Volva present; ring absent	Volvaria	126
Volva absent; ring absent	Pluteus	130
(*b*) Continuous with cap, not separated easily—		
Gills sinuate to adnexed	Entoloma	130
Gills decurrent to adnate	Clitopilus	136
II. Stem excentric or none—		
Always growing on wood	Claudopus	138

SUBDIVISION C

Brown-spored Genera

I. Stem central—		
(*a*) Continuous with cap; same texture—		
Ring present	Pholiota	140
Ring absent—		
With cobwebby veil, often very profuse, gills powdery	Cortinarius	144
With fibrillose veil, closely joined to cuticle of cap, gills sinuate to decurrent	Inocybe	150
Fibrillose veil present or absent, gills adnate to decurrent	Flammula	150
Gills adnexed to sinuate	Hebeloma	152
(*b*) Continuous with cap, texture different—		
Gills adnate, margins incurved	Naucoria	155
II. Stem excentric; rarely central, lateral or none—		
Gills separating easily from cap, plants very soft	Paxillus	155

SUBDIVISION D

Purple-spored Genera

		Page
I. Distinct from cap, easily separating—		
Ring often prominent	Psalliota	157
II. Continuous with cap, not easily separating—		
Ring distinct	Stropharia	164
Ring indistinct, margin of cap often appendiculate—		
Gills adnate to sinuate	Hypholoma	167
Ring absent—		
Gills adnate to decurrent	Psilocybe	171

SUBDIVISION E

Black-spored Genera

I. Distinct from cap, flesh very thin—		
Plants becoming deliquescent with age, melting into inky fluid	Coprinus	171
II. Continuous, with firm cap—		
Stem long, slender; plants not deliquescent	Panaeolus	175

Second Division

PORE FUNGI

I. Plants, fleshy throughout, in shape like the common mushroom—		
(*a*) Tube layer easily separated from cap	Boletus	177
(*b*) Tube layer not easily separated from cap—		
1. Pores irregular network	Boletinus	189
2. Surface of cap with conspicuous tufts	Strobilomyces	191
II. Plants fleshy, not shaped like the common mushroom	Fistulina	194
III. Plants corky or woody, soft and hardening—		
(*a*) Surface of plants with brittle crust	Ganoderma	196
(*b*) Surface without brittle crust	Polyporus	198

Third Division

TEETH-BEARING FUNGI

Plants of various shape and form, with prominent, long and slender, soft spines or teeth	Hydnum	200

Fourth Division

CLUB AND CORAL FUNGI

Plants without cap, soft, tough, either single clubs or in coral-like formations	Clavaria	206

Fifth Division

JELLY FUNGI

Plants on ground, usually on decaying twigs, or fences, forming often bright coloured masses; parchment-like when dry, gelatinous and soft throughout when moist	Auricularia	211

SECOND SUBGROUP

GASTEROMYCETES

		Page
I. Stem-like receptacle arising from a definite egg-stage, with volva at base of stem—		
(*a*) Fruiting body at apex prominently differing in dimension from stem, more cap-like, with more or less prominent netted veil	Dictyophora	215
(*b*) Exactly similar but no trace of a veil	Ithyphallus	217
(*c*) Fruiting body at apex same dimension as stem, though prominently differing in colour; no trace of veil	Cynophallus	217
II. Stem-like receptacle absent or rudimentary; volva absent—		
(*a*) Fruiting body opening at maturity with round hole at apex— Plants star shaped when mature	Geaster	219
Plants not star shaped, globular, pear or flask shaped; base sterile	Lycoperdon	221
Plants globular, with indistinct apical mouth, covering wall irregularly rupturing at maturity; base not sterile	Bovista	226
(*b*) Fruiting body not opening with round hole at apex; covering rupturing irregularly at maturity; slightly sterile base	Calvatia	226
(*c*) Fruiting body never wholly intact or closed, mature forms resembling minute bird nests	Cyathus	231

SECOND MAIN GROUP

ASCOMYCETES

I. Plants with prominently pitted or gnarled cap—		
(*a*) Cap irregularly pitted	Morchella	231
(*b*) Cap irregular gnarled mass	Gyromitra	235
II. Plants with cap formed by saddled-shaped, folded lobes	Helvella	235
III. Plants saucer-, cup-, or goblet-shaped—		
(*a*) Flat, disk-like; or shallow saucers	Plicaria	241
(*b*) Bell- to cup-shaped, generally smooth outside	Pustularia	241
(*c*) Bell- to cup-shaped, outside woolly, short stem	Sarcoscypha	244
(*d*) Long-stemmed goblet-shaped	Geopyxis	244

CHAPTER IV

HINTS TO COLLECTORS

The facility and ease with which a correct determination of a fungus may be made, depends largely upon the more or less perfect and normal condition of the specimen. Dry seasons and the heat of the sun generally, produce peculiar changes; the distinctive characters present during ordinarily humid conditions are thus often changed beyond recognition; excessively wet weather also results in emphasizing certain features upon which no great stress should ordinarily be laid. After spells of dry weather the surface of the cap may show reticulations not present in normal forms. Spells of rain may affect the general appearance as well as the colour and condition of the cap. Light and shade, or mechanical interferences may cause twisting and curving of stems, not normal.

For these and other reasons a beginner may encounter serious difficulties in correctly determining a species. Only when large numbers of specimens have been studied, preferably under all conditions of growth, will it become more easy to properly regard the curious changes brought about by such influences. In species growing in clumps there occur variations in shape due to the pressure of one member of a group against another, but this cause will be ever remembered when once observed on the occasion of a collecting trip.

It is more difficult when abnormal specimens are submitted for identification without any notes or comments. Under such circumstances it is well to remember what has been said above. First of all, it is wise to become familiar with the normal forms, to which these pages are devoted.

In collecting fungi an open eye should be kept when roaming through fields and meadows, woods and mountain sides, for old stumps, the harbourer often of prolific and instructive associations, or for "fairy rings," a circular growth formation frequently assumed by some of our native fungi. Dump-heaps, piles of decaying sawdust or mill refuse, manure piles, lawns, and meadows, especially where animals have grazed, should be carefully surveyed. Fungi once located in goodly numbers in such spots may yield many a good harvest on future occasions.

No special outfit is needed in collecting mushrooms; an ordinary fruit basket, a strong knife or pointed stick, twine, strong paper to cover the basket, tissue paper as used in wrapping apples or oranges, and waxed paper for the more sticky forms, is all that is required. Cardboard boxes to protect small and fragile specimens will come in very useful. Grass, leaves, or moss packed loosely but firmly around each plant as collected, will protect them from damage and injury, thereby preserving many a dainty character that would otherwise be lost.

Most of the specimens of fleshy fungi sent in for identification, reach us in a putrid and decayed condition, rendering determination often impossible. Such conditions can be avoided to some extent by care in packing, but above all, by the selection of sound specimens. Once invaded by maggots—and few are not—it is merely a question of hours before they will have changed into an unsavoury mess.

A sketch of a fungus submitted with a specimen is most useful, and proper colour description is almost indispensable. In describing these, compare them to the colour of some well-known object or fungus, familiar to all. If left to individual conception of colour, opinions are bound to differ as much as the colours themselves. The scientific collector will preserve his specimens permanently for future reference. This is done by a laborious drying process, which requires much skill, and as the results are never very satisfactory, the amateur is advised not to attempt it.

There is, however, one feature that cannot be too emphatically recommended, and that is the keeping of field notes by the collector. Such notes should in all cases accompany specimens sent for information or collected for study. The more carefully they are taken, the less the labour of identification, and the more valuable the result. As to the manner of recording one's field observations, we cannot improve upon the method suggested by the late Professor George Francis Atkinson, a mycologist of wide reputation. It is as follows:—

FIELD MEMORANDA

No.....*Locality*.....
Date.....*Name of Collector*.....
Weather.....
Habitat.....
If on ground, low or high, wet or dry, kind of soil; on fallen leaves, twigs, branches, logs, stumps, roots, whether dead or living, kind of tree; in open fields, pastures, etc., woods, groves, etc., mixed woods or evergreen, oak, chestnut, etc.

Plants.....
Whether solitary, clustered, tufted, whether rooting or not, taste, odour, colour when bruised or cut, and if a change in colour takes places after exposure to the air.

Cap.....
Whether dry, moist, watery in appearance (hygrophanous), slimy, viscid, glutinous; colour when young, when old; whether with fine bloom, powder; kind of scales and arrangement, whether free from the cuticle and easily rubbed off. Shape of cap.

Margin of Cap.....
Whether straight or incurved when young, whether striate or not; when moist.

Stem.....
Whether slimy, viscid, glutinous, kind of scales, if not; smooth, whether striate, dotted, granular, colour; when there are several specimens test one to see if it is easily broken out from the cap, also to see if it is fibrous, or fleshy, or cartilaginous (firm on the outside, partly snapping and partly tough). Shape of the stem.

Gills or Tubes.....
Colour when young, old, colour when bruised, and if colour changes; whether soft, waxy, brittle, or tough; sharp or blunt, plane or serrate edge.

Milk.....
Colour if present, changing after exposure, taste.

Veil.....
(Inner veil). Whether present or not, character, whether arachnoid (cobwebby), and if so whether free from cuticle of pileus or attached only to the edge; whether fragile, persistent, disappearing, slimy, etc., movable, etc.

Ring.....
Present or absent, fragile, or persistent, whether movable, viscid, etc.

Volva.....
Present or absent, persistent or disappearing, whether it splits at apex or is circumscissile, or all crumbly and granular or floccose, whether the part on the pileus forms warts, and then the kind, distribution, shape, persistence, etc.

Spores.....
Colour when caught on white paper.
To the close observer additional points of interest will often be noted.

By closely and systematically following this chart, field notes will soon become a matter of habit, and the collector will be materially assisted in identifying his specimens. Haphazard observations often lead to trouble, and recommendations concerning edibility may prove dangerous in the case of poisonous forms insufficiently studied.

The results of a collection trip, carefully wrapped together with one's field notes, may now be subjected to careful study, which will enable us to complete our memoranda in regard to features not observed in the field, such as colour of spores, the character of stem, gills, and pores, etc. Once in possession of all these characters, we may proceed with the identification of our fungi according to the guide to genera of fungi dealt with in Chapter III. Let us assume, for example, that we wish to identify two fungi of the ordinary parasol type.

The first is a stately specimen. Notwithstanding a careful survey of the locality, we have found only specimens in the same stage of development. They are rather brittle and floury to the touch. The caps are large, so we cut off the stem with a sharp knife, wrap stem and cap separately and then together to avoid confusion. The caps show gills, and the spores are white. Having ascertained these features we turn to page 25, "Gill Fungi," of which the first "Subdivision A" deals with the white-spored genera. These are divided into: (1) plants fleshy to firm, and (2) plants tough, more or less leathery. These fleshy forms are divided into smaller sections, (*a*) stem easily separating; (*b*) stem continuous with cap, etc.; and (*c*) continuous, but of different texture. We give the stem of our specimen a twist and find it separating quite easily from the cap, hence we turn back to section (*a*), which is subdivided into: (1) fungi with volva and ring, and (2) without volva. The stem of our specimen carries a most prominent and curtain-like ring, as well as a typical volva at the base; hence our fungus belongs to the genus *Amanita*, the species of which are described on page 32, to which we now turn.

Having recognized this specimen as one of our most deadly, and having handled it freely, it is important to thoroughly wash our hands and dispose of the specimen where it cannot cause mischief.

The second specimen belongs to the pore fungi. We turn to page 27 of our guide. In studying the pore fungi we find our specimen to belong to the fleshy type included under section I. These are subdivided into (*a*) plants with the tube layer easily separated from the cap, and (*b*) not easily separable. In our specimen we are unable to separate the pore layer from the rest of the cap. Thus we should find it among the genera with this character. A glimpse at the pores shows their net-like arrangement, which enables us to trace our fungus to the genus *Boletinus* (page 189). On consulting page 189 we find this genus described with full detail, enabling us to confirm our identification.

It will thus be seen that once the characters which have to be studied are carefully recorded, it is an interesting and simple matter to trace the fungi dealt with in our bulletin. The more comprehensive publications on fungi all contain a proper key or guide to the fungi, and once one has mastered the use of a key according to the distinctive characteristics of fungi, the amateur has qualified for more advanced work, which will be found exceedingly interesting.

CHAPTER V

DESCRIPTION OF GENERA AND SPECIES

FIRST MAIN GROUP

BASIDIOMYCETES

FIRST SUBGROUP

HYMENOMYCETES

First Division

GILL FUNGI

SUBDIVISION A

White-spored Genera

Genus 1

Amanita (Pers.) Fr.

The species of this genus should present no serious difficulties in identifying, because of several prominent and important characters distinguishing them from other fungi. The conspicuous egg-shape of the young plant, entirely covered by a thick volva, the prominent curtain or veil-like ring, and the typical cup at the base of the stem of the mature plant, are features which emphatically impress the student. The cap is fleshy, at first convex, becoming expanded. The gills are free from the stem, which is central and different in substance from the cap, and is readily separated from it. The genus is small, but highly interesting on account of the character and bright colouring of the cap in certain species. *It includes the most deadly of fungi.* Strangely enough, a few edible species have been recorded in this genus, but the collector is warned to exercise great precautions; preferably avoid them altogether.

Amanitopsis, an allied genus, is distinguished from it by the absence of the ring. Since the ring of some *Amanita* species may be easily rubbed off, great care should be used in taking into account all distinguishing features when making any determinations. *Lepiota*, another related fungus, differs prominently from *Amanita* by the absence of the volva.

Amanita Caesarea Fr.

ORANGE-YELLOW AMANITA OR CAESAR'S AGARIC

(Pl. 5)

EDIBLE

This beautiful and majestic fungus is wholly enclosed in its earliest stages by a white volva as the egg-shell encloses the egg. It soon ruptures this covering membrane and pushes through its bright coloured cap. CAP: of the full-grown plant from 2 to 3½ inches in diameter; broad ovate or bell-shaped at first, becoming plane; dry; smooth; fragile; free from warts or scales. Colour at first red or faintly streaked with yellow, changing to deep orange or orange-yellow. MARGIN: thin; acute; striate; slightly incurved. FLESH: soft; thin; white; slightly coloured below the cuticle or skin, and faintly yellow towards the gills. Nearly odourless. GILLS: free from stem; close; even; thin; broader towards the margin of the cap. Colour yellow, occasionally like the yolk of an egg. STEM: central; 4-6 inches long, ½ inch in diameter in the middle; interior stuffed with fibrils; becoming hollow; tapering towards the apex; cylindrical; covered with fleecy scales below the ring; enlarging at base into a bulb ¾ to 1 inch in diameter. Colour yellow. RING: wide, like a broad collar; pendulous; delicate; yellow. VOLVA: large, ¾ to 1½ inch wide, 1 to 2 inches high; free from stem; ovate; white. A small "inner" volva about ½ inch high encircles base of stem.

Solitary; on ground, often beneath pines; July and August. Infrequent.

This mushroom has been favourably known as an article of diet by the ancient Romans. It, together with the Chanterelle, ranked amongst the choicest and noblest dishes served at the table of the Emperors.

Unless one is very familiar with the *Amanita* species, great caution should be exercised in using this one for food, as it resembles to a certain extent the poisonous Fly Agaric, *A. muscaria*, from which it can be readily distinguished by its yellow gills.

Amanita flavocónia Atk.

YELLOW-DUSTED AMANITA

PROBABLY POISONOUS

CAP: 1½ to 3 inches broad; convex, becoming plane, sub-umbonate; covered with floccose tufts, the remnants of the universal veil, which are easily rubbed off; otherwise smooth; shiny; bright lemon colour. MARGIN: even. FLESH: thin; white; fragile. GILLS: free, close, rounded towards the stem, obtuse, often ventricose, medium broad; colour pure white. STEM: 3 to 6 inches long, ¼ to ½ inch wide; stuffed, i.e., having a core filled with a delicate pith; tapering towards apex; covered with flaky scales often arranged to form irregular rings; shiny; faint lemon colour; bulbous at base. RING: persistent; pendulous; superior; membranous; light lemon. VOLVA: prominent, rather high; granular; very fragile; parts often adhering to surrounding soil. Colour yellow, darker than cap.

It is found growing solitary or scattered; on low, sandy soil under pines; July to September.

AMANITA CAESAREA

Fig. 1. Egg stage. Fig. 2. Section of same showing young plant entirely enveloped by volva.
Fig. 3. Cap pushing through ruptured volva. Fig. 4. Cap taking shape. Note striate margin.
Figs. 5 and 6. Mature plants.

AMANITA MUSCARIA

Amaníta muscária (L.) Fr.

FLY AGARIC

(Coloured Plate No. 1 and Pl. 6)

DEADLY POISONOUS

The Fly Agaric is a handsome plant and one of the most conspicuous of the genus. CAP: large, from 4 to 6 inches; globose at first, convex, then nearly plane; surface when fresh slightly viscid. Its colour is subject to great variation, ranging from deep orange-red to yellow, paling with age, yellow being the more common colour. MARGIN: slightly striate in mature plants. The surface is covered with thick, angular, persistent scales, usually white, often yellowish, which are remnants of the volva and rub off easily. FLESH: white, yellow beneath the cuticle; odourless. GILLS: free, but on reaching the stem form slight decurrent lines upon it; colour white to faintly yellow. STEM: white or pale sulphur; interior at first stuffed with web-like fibrils, becoming hollow; enlarged at the base into a conspicuous bulb, covered with prominent concentric ridges, the remnants of the volva; 4 to 8 inches long, ½ to 1 inch thick. RING: very soft; ragged; large; white; superior. VOLVA: white or yellowish; fragile.

The Fly Amanita is easily identified on account of its scaly cap, often brilliantly coloured, its large ring, and the volva on its bulb-like base. It is one of the most poisonous species, and unfortunately is widely distributed. Even a novice should have no difficulty in distinguishing it from other mushrooms.

It occurs along roadsides, wood margins, and open woods generally, from June till frost.

Amaníta phalloídes (Vaill.) Fr.

DEATH ANGEL

(Coloured Plate No. 2 and Pl. 7)

DEADLY POISONOUS

This plant, though found in the same locality, will vary extremely in colour, in the manner in which the volva is ruptured, and in the surface of the stem. The changes are often so pronounced as to be confusing to the amateur.

CAP: from 3 to 4 inches broad; commonly glossy white, yellowish, or dull green, but often olive-grey to greenish-brown; viscid when moist; smooth, rarely sprinkled with fragments of the volva; ovate, becoming convex and finally expanded. MARGIN: even, not striate. FLESH: white; not objectionable to the taste, but sometimes has a disagreeable odour. GILLS: free; ventricose; broad; rounded at the stem end; white. STEM: from 3 to 5 inches long, ½ to ¾ inch thick; stuffed or hollow; smooth or slightly floccose; usually white; tapering towards cap; bulbous. RING: superior; thin; slightly striate; usually entire; white. VOLVA: more or less buried in the soil; semi-free; lobed; thick and fleshy; white.

It is of common occurrence in woods, groves, and along borders of woods, from July to October.

AMANITA PHALLOIDES

Fig. 1. Egg stage.

Fig. 2. Gills entirely covered by veil, prominent volva at base.

Its white form somewhat resembles the common field mushroom, but a careful examination will disclose in the field mushroom the pink to dark purple coloured gills and the absence of a volva. It also resembles *Lepiota naucina*, which is easily distinguished by the absence of a volva and by its tapering, smooth, though bulbous base of the stem.

A. phalloides is the most dangerous of all fungi, and is responsible for most of the deaths resulting from the deplorable ignorance of mushrooms generally.

Genus 2

Amanitópsis Roze.

This genus resembles in its general characters the genus *Amanita*. There is one distinctive feature, viz. the absence of the ring. This character should be carefully watched for, since in some *Amanita* species the ring may have been rubbed off. The cap is fleshy; stem central, separating from cap. The gills are free, occasionally tending towards being adnate. Volva clinging to and sheathing the stem.

As far as known, no poisonous species are included in this genus. Personally, we have, however, strictly avoided these in preference to others.

Amanitópsis vaginàta (Bull.) Roze.

RINGLESS AMANITA

(Pl. 8)

EDIBLE

The thin volva envelopes the young plant completely at first. CAP: 2 to 3 inches broad; oval to bell-shaped, convex, becoming expanded; thin; fragile; smooth; sometimes umbonate; rarely with fragments of the volva adhering to the surface; variable in colour from grey to mouse-brown, and one variety white, the commonest colour in this district is leaden. MARGIN: distinctly and deeply striate. FLESH: white; thin; skin separating readily from cap. GILLS: free; fragile; close; irregular; ventricose; white. STEM: hollow or stuffed; cylindrical; even or slightly tapering upward; smooth or with fine mealy particles or woolly scales; variable in colour; 3 to 5 inches long, ½ to ⅝ inch thick. RING: wanting. VOLVA: soft; closely but loosely adhering to the base of stem; thin; fragile; white.

This plant is widely distributed, growing on the ground in open woods or wooded pastures, June to November.

Genus 3

Lepióta (Pers.) Fr.

This genus differs from *Amanita* in having no volva and from *Amanitopsis* by the presence of a ring. In most species the cap is covered with scales or coarse granules, caused by the cuticle of the cap cracking as the pileus expands. The gills are free from the stem and generally

AMANITOPSIS VAGINATA

LEPIOTA AMERICANA

white in colour. The stem is hollow or filled with a pithy substance, and separates readily, though in texture different, from the cap. The ring is large and loosely attached to the stem, or it may be movable. In consequence, it is easily seen in the young plant, but may have disappeared as the plant grows older.

Lepióta americána Pk.

AMERICAN LEPIOTA

(Pl. 9)

EDIBLE

This is a very conspicuous plant, somewhat rare in this locality. CAP: oval or bell-shaped when young, 2 to 4 inches broad; uniformly coloured reddish-brown. The surface is dry, firm, and tough. As the cap expands the centre becomes broadly elevated and the cuticle cracks from the margin towards almost the centre of the cap, into fine concentric rings, which form scales, exposing the white surface beneath. This gives a conspicuous appearance to the plant. The centre of the cap is often free from scales. MARGIN: thin; remaining for a long time incurved, and marked by finely grooved lines (striations). FLESH: soft; thick at the centre of the cap; at first white, but quickly turning reddish where wounded. GILLS: free from the stem, close to each other, thin, broader in the centre (ventricose); turning reddish where touched or wounded. STEM: 3 to 5 inches long, ¾ to 1 inch at the swollen base, tapering towards the apex; smooth; hollow, but having the core filled with a fine, silky pith; fibrous and tough, often cracking into grooves, ventricose above the base. It differs in substance from the cap, and easily separates from it, leaving a cup-like depression. It is furnished with a large, white, pendulous RING, which sometimes disappears as the plant matures.

It was found growing on a pile of refuse from street sweepings, in clusters composed of many individuals. It is one of the finest for the table, and on cooking turns red. It is found in September and October.

Lepióta aspérula Atk.

SLIGHTLY ROUGH LEPIOTA

(Pl. 10)

EDIBLE

CAP: 1½ to 2 inches broad; convex at first, but becomes plane as it grows. There is a small elevation in the centre, with a depressed zone around it. The surface is dry, and thickly covered with minute, pointed, dark-brown scales. MARGIN: thin, frequently wavy, and incurved (involute), especially so in its early stages. FLESH: soft, thin, and quite fragile; white or cream. GILLS: free from the stem, close to each other, thin and easily broken; rounded towards the stem end, and broader in the middle, their edge is minutely toothed (serrulate). The colour is faintly yellow. The interior of the STEM is stuffed with a webby pith, frequently becoming

LEPIOTA ASPERULA

LEPIOTA CEPAESTIPES

hollow when old. It is fragile; tapers upwards; of the same substance as the cap; and abruptly enlarges where it joins the cap. The base is swollen. The exterior is roughened by erect, brownish scales, smaller than those on the cap. It is from 1 to 2 inches long, ¼ to ⅜ inch thick; and of the same colour as the cap, often lighter. RING: white; hangs down all around the stem; and is composed of fine white threads.

It was found growing in leaf mould under open hardwood trees, during the latter part of July. A small area was thickly covered with these plants. Some grew in clusters, but others singly.

Lepióta cepaéstipes (Sow.) Fr.

ONION-STEM LEPIOTA

(Pl. 11)

EDIBLE

CAP: 1 to 3 inches broad, thin, oval, becoming expanded–campanulate, fragile, umbonate; surface covered with dense, bran-like, generally white, but sometimes brown scales, easily coming off. MARGIN: splitting, thin, wavy, frequently appendiculate, acute. It is flat-white in colour, and when the scales are removed the surface appears like white kid-leather. FLESH: soft; thin; white. GILLS: free, rounded towards stem, close, thin, fragile, narrow, broader at inner extremity; white. STEM: 2 to 4 inches long, ½ to ⅜ inch thick at apex; hollow, with a small core stuffed with a close, silky pith; curved and twisted, frequently grooved at base, slender, tapering towards apex, ventricose; densely covered with fine, white, bran-like scales. Colour white. RING: superior, pendulous, thin, smooth on upper side, floccose on under side, fragile; white. Odour and taste mild.

Generally in dense clusters; growing on rich soil, particularly on refuse dumps of street sweepings.

This plant takes its name from the resemblance of its stem to the stalk of a seed onion. It is common locally on dumps, from June to September.

Lepióta cristáta (A. et S.) Fr.

CRESTED LEPIOTA

(Pl. 12)

EDIBLE

An exceedingly attractive plant, with a CAP ½ to 1½ inches broad; thin; ovate, bell-shaped, then convex and expanded, umbonate or obtuse. Surface at first entirely dull-reddish or reddish-brown, but as the cap expands, soon breaking into small, reddish-brown scales, arranged in concentric rings except at the umbo, exposing the white cuticle underneath. FLESH: thin; white. GILLS: white; free, rather close, narrow, sometimes forked near the stem, edge minutely

LEPIOTA CRISTATA

LEPIOTA MORGANI *(Photo. courtesy of C. L. Shear, Washington, D.C.)*

wavy. STEM: 1 to 2 inches long, ⅛ to ¼ inch broad; slender; smooth or fibrous; equal; hollow or stuffed with a loose pith; white. RING: small; white; often breaking up and disappearing. ODOUR: rather strong, but lost in cooking.

This plant is common on lawns or in grassy places in low lying woods, from July to October.

Lepióta Mórgani Pk.

MORGAN'S LEPIOTA

(Pl. 13)

POISONOUS

This is one of the largest gill fungi found, often more than a foot across. CAP: 5 to 11 inches broad; fleshy, soft; when fully grown convex to expanded or even depressed; the brownish or yellowish cuticle eventually breaking up, except at the centre, into irregular, patchy scales. FLESH: thick; firm; white, when bruised changing colour. GILLS: quite free, close, broad at margin, narrow towards stem; at first white, changing to dull olive. STEM: 4 to 8 inches long, ½ to ¾ inch above, often ¾ to 1½ inches at base; stuffed with fibrils; smooth; stout; firm; equal or tapering towards the cap from a club-shaped base; whitish or greyish white, tinged with brown. RING: thick; movable; large; superior; firm. Spore prints usually show a dull green tint.

Meadows and open woods, often forming large circles (fairy rings). June to October. Infrequent in this locality; and a species that is to be regarded with suspicion, having caused trouble in several instances.

Lepióta naucína Fr.

SMOOTH LEPIOTA

(Pl. 14)

EDIBLE

CAP: soft; fleshy; white; smooth, like white kid-leather; averaging from 1½ to 4 inches wide. Typically hemispherical at first, changing to convex, then nearly plane. Older specimens turn buff in colour. MARGIN: thick; smooth, and frequently has remnants of the veil adhering to it. FLESH: thick; firm; and white. GILLS: free from the stem, rounded behind and swollen in the middle; white at first, later changing to a pinkish tint. STEM: 2 to 3 inches long, ¼ to ½ inch thick; cylindrical; hollow, with a core stuffed with loose threads; tapering gradually to the cap, and has an enlarged, swollen base. RING: quite pronounced, singularly disk-like. Its upper surface is smooth and white like the cap, the lower surface more spongy. When the plant gets old the ring is movable on the stem.

This species grows in similar situations to the common field mushroom, and sometimes is mistaken for a white variety of it. It is also found growing in woods. The poisonous *A. phalloides* should not be confused with this species. The former differs, as we know, in having a volva. It is of considerable importance as an article of food, and grows in such abundance that frequently pastures are dotted white with it. It may be found right up to frosty weather.

LEPIOTA NAUCINA

LEPIOTA PROCERA

23837—4

Lepióta procéra (Scop.) Fr.

PARASOL MUSHROOM

(Pl. 15)

EDIBLE

A beautiful and stately fungus. CAP: varies in size from 4 to 6 inches; at first egg-shaped, becoming expanded as it grows, with a raised centre (umbonate). When old the margin frequently turns up (revolute). The cuticle breaks up into large, widely spaced, radiating, brown scales. The centre remains unchanged, and is smooth, and dark-brown. MARGIN: thin; entire. FLESH: soft, spongy, thin; white. The general colour of the cap is a greyish-brown, showing a satiny surface beneath. GILLS: free and remote from the stem; broad, rounded behind. They are close to each other; larger in the middle and in colour white. STEM: cyclindrical, even or slightly tapering towards the cap; variable in length, from 7 to 9 inches, 3/8 to 5/8 inch wide; hollow, like a thick-walled tube, and filled with cobwebby threads. Towards the apex it is covered with a powdery bloom; the cuticle of the lower part is cracked, forming irregular, ring-like markings. The base is enlarged into a prominent bulb. It separates easily from the cap and leaves a cup-like depression in it. RING: large and thick; when old it is movable.

This plant is conspicuous as being the tallest species found in this locality; and with its greyish cap, adorned loosely with large scales, cannot be mistaken for any other species. It is not common with us. It is found growing singly in open, wooded pastures. Some authors regard it as the best edible species.

Genus 4

Armillária Fr.

Cap fleshy, stem central, uniform in texture with cap, hence not easily separated from it. The gills are adnate, sinuate or decurrent. Ring very distinct. No volva. The genus *Clitocybe* is closely related, but has no ring.

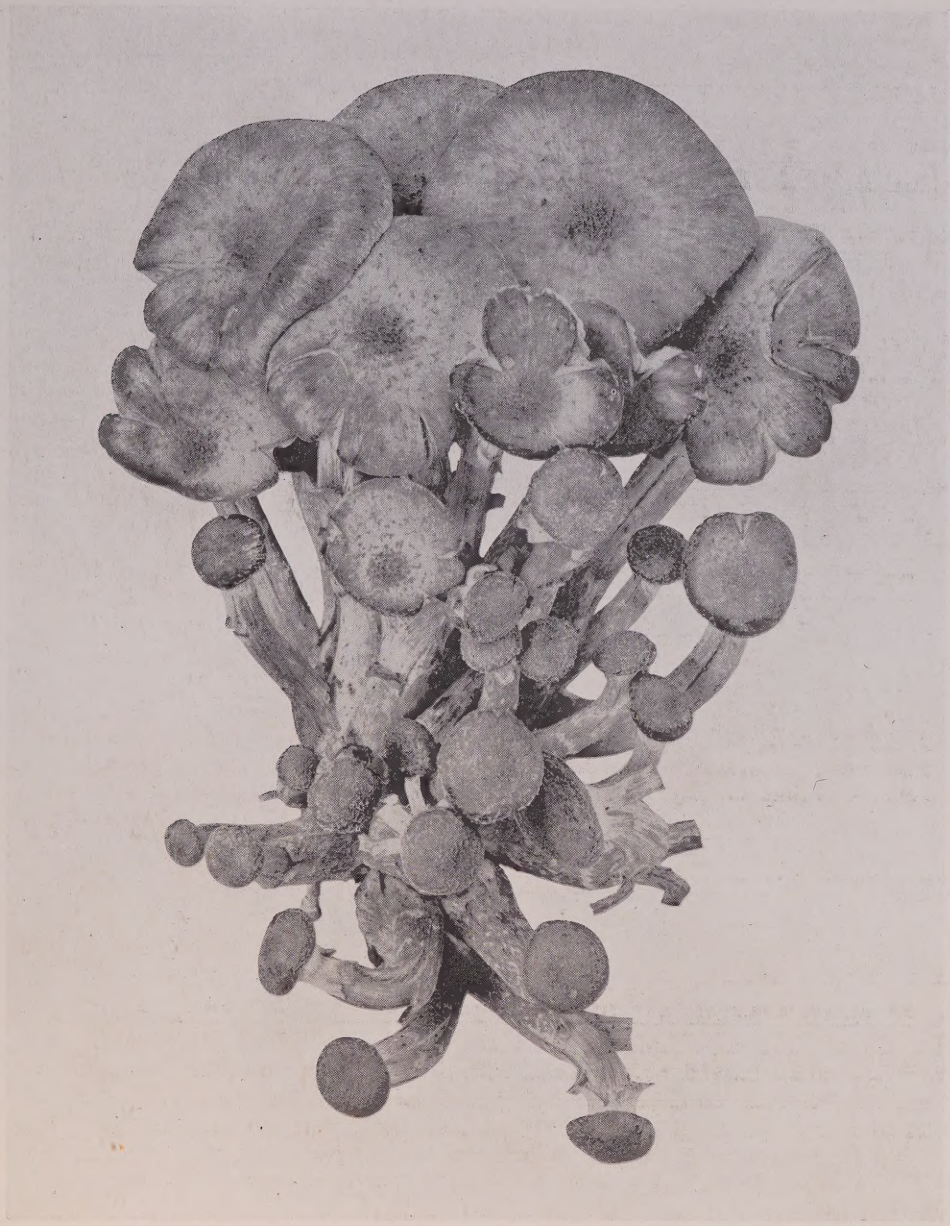
Armillária méllea (Vahl.) Fr.

HONEY AGARIC

(Pl. 16)

EDIBLE

This species is one of the most variable fungi as far as shape, form, and colour are concerned. In its early stage the CAP is almost oval, later expanding, becoming convex, often exhibiting a sharply raised centre. It rarely exceeds 4 inches in width, its average size being nearer 2 to 4 inches. It is covered with irregular, pointed, darkish-brown scales. The colour is extremely variable, ranging from a light buff to dark-tawny, with occasional ochre yellow to greenish yellow; some shade of yellow predominates, but it may be a dull white or honey-colour to chest-nut-brown. FLESH: pale to dirty-yellowish, becoming darker when old. The taste in its raw condition is astringent, acrid, not really pleasant, although these properties disappear entirely



ARMILLARIA MELLEA

23837—4½

TRICHOLOMA PERSONATUM

on cooking, when it will be found rather insipid, though eagerly collected for the table. It is tender only when young. GILLS: lighter in colour than the cap, dingy white to creamy, showing reddish-brown patches with age. They are rather distant from each other and may occasionally be found attached to the stem, even descending it somewhat (decurrent). STEM: spongy within, often hollow and tough; of fairly even width, though enlarging towards its base. The exterior is fibrous, smooth or minutely scaly; generally reddish-brown or lighter towards the base. It is from 2 to 4 inches long, varying from ¼ to ¾ inches thick. RING: white, differing little in colour from the flesh. It may be cottony or thick, but thin in old specimens, likely to disappear.

This plant is common in open woods or cleared land, on the ground or on decayed wood, at base of stumps or trees, generally growing in large clusters. The mycelium forms thin, cord-like strands, white at first, but afterwards becoming shining and dark brown. These strands are technically known as "Rhizomorphs." It is one of the luminescent forms (see page 62).

Genus 5

Tricholóma Fr.

The volva and ring are both lacking in this genus. It comprises many species, some of which are said to be poisonous.

The mode of attachment of the gills to the stem is a prominent feature by which this genus differs from other white-spored genera. They are notched or sinuate, the notch sometimes being barely perceptible. The cap is fleshy, irregular, convex to wavy. Sometimes it is broadly umbonate when old. The stem is central, fibrous, fleshy, usually short and stout, and of the same substance as the cap, not separating easily. *Tricholoma* is somewhat similar to *Clitocybe*, which has decurrent gills. It may also be confused with *Collybia*, the latter having a horny or cartilaginous stem more or less distinct from the fleshy cap.

Tricholóma personátum Fr.

LILAC-HUED TRICHOLOMA

(Pl. 17)

EDIBLE

CAP: 2 to 6 inches broad; variable; thick; convex, becoming expanded, sometimes broadly umbonate when old; moist; smooth. In the young plants the surface is somewhat downy, and prominently lilac or violet. The colour changes with age, fading to greyish or brownish. MARGIN: thick; smooth; incurved, and remains so till the plant is partly grown. It frequently becomes wavy when old. FLESH: firm; thick; whitish, with a tint of violet, underlying the skin. GILLS: free from the stem, broad, rounded behind close, equal; lilac or violet when young, changing to ashy grey with a mauve tint. STEM: 2 to 3 inches long, ¾ to 1¼ inches thick; solid, frequently becoming spongy within. It tapers to the apex; is fibrillose, of the same

TRICHOLOMA RUTILANS

TRICHOLOMA TERREUM

substance as the cap and confluent with it. The upper part is covered with a bloom. It is irregularly swollen at the base. The colour is deep violet, changing to greyish when mature. In young specimens the entire plant is of mauve colour.

This is a common species and one of our safest edible ones. It grows from September to frost, in groups or singly, in open places in thin woods, especially in leaf mould.

Tricholóma rútilans (Schaeff.) Fr.

MAROON TRICHOLOMA

(Pl. 18)

EDIBLE

CAP: 3 to 5 inches wide, at first bell-shaped, later expanding, broadly umbonate. The surface is frequently centrally depressed in old specimens. It is fragile, dry, covered with tufts of fine, short, silky hairs or down, dense towards the centre. The colour is dark-red or purplish, on a yellow ground. MARGIN: thin, wavy, incurved when young. FLESH: soft, thin, spongy; yellow. GILLS: yellow; attached to the stem, rounded behind, close to each other, broad, of unequal length; edges thick, serrate to woolly. STEM: 2 to 3 inches long ⅜ to ⅝ inches thick; solid, often spongy within; curved, equal, confluent; and of the same substance as the cap. It is thickened at the base, covered with short, reddish hairs on a yellowish background. The interior is coloured yellow the same as the flesh of the cap.

This species is not frequent, and is found on decaying wood. It is a most handsome plant, and easily recognized by its velvety cap of a reddish-purple hue. June to October.

Tricholóma térreum (Schaeff.) Fr.

MOUSE-GREY TRICHOLOMA

(Pl. 19)

EDIBLE

CAP: 1½ to 2½ inches wide; at first convex, becoming plane and raised in the centre; fleshy, thin, fragile, dry. The surface exhibits a granulated or velvety appearance. The colour is mouse-grey to greyish-brown. FLESH: soft, thin, very brittle; greyish; farinaceous in taste. GILLS: adnate, not very close to each other, with eroded edge. They are widest in the middle, brittle, and deeply sinuate; colour white, turning ash-coloured. STEM: 1½ to 2 inches long, ¼ to ⅜ inch thick; solid or spongy within. It is equal, slightly curved, and covered with brown fibrils showing grey underneath.

This species is plentiful at times, and is found under pine trees or in open woods. It grows either singly or in scattered groups, during September and October.

TRICHOLOMA VACCINUM

Tricholóma vaccínum (Pers.) Fr.

HAIRY-MARGINED TRICHOLOMA

(Pl. 20)

EDIBLE

This species is very variable, but its hairy margin is a most distinctive feature.

CAP: 1 to 3 inches wide; fleshy, firm; slightly umbonate, convex, becoming expanded and nearly plane. It remains incurved for a considerable time. The surface is dry, dull, with dense scales at first, later breaking into fine cracks, or into pointed, reddish-brown scales. The colour is cinnamon-brown to dark reddish-brown. MARGIN: incurved; fragments of the universal veil adhering to it for a short time; thin; acute, becoming wavy when old; and prominent by its short, soft, entangled hairs. FLESH: thin, soft; white at first, turning pinkish on exposure to the air. GILLS: variably attached, adnexed to sinuate, often with a decurrent tooth, sub-distant, broad, unequal; colour dingy white, later sprinkled reddish-brown. STEM: 2 to 3 inches long, 3/8 to 1/2 inch thick; hollow from the start, often becoming spongy. It is equal or tapering towards the apex, confluent with cap; covered with fine, chestnut-brown, torn fibrils, except at the apex; colour whitish at apex, shading to light reddish-brown at base.

This plant is plentiful, under or near coniferous trees, growing singly or in clusters. August and September.

Genus 6

Clitócybe Fr.

This genus lacks a volva and a ring. The cap is generally fleshy, but towards the margin it becomes thinner. It assumes a variety of shapes, and may be plane, slightly depressed in the centre, or pronouncedly funnel-shaped. The latter form is more common. The gills are decurrent, rarely adnate, with sharp edge. The stem is central, of the same substance as the cap, and does not readily separate from it. The plants are found growing on the ground, singly or in crowded groups, but a few grow on dead wood. The genus *Collybia* is similar to it, but differs in the structure of the stem, which is not of the same texture as the cap.

Clitócybe déalbáta (Sow.) Fr.

IVORY CLITOCYBE

EDIBLE

CAP: 1/2 to 2 inches broad. It varies in shape considerably, and many plants have been described as varieties of it. It is tough; convex, becoming expanded, depressed in centre, often umbilicate, frequently revolute and undulate; fleshy; smooth; even; dry. MARGIN: very thin; colour shining white to silky grey. FLESH: thin; dry; white. GILLS: adnate or slightly decurrent, close, thin, narrow; colour white to greyish, unchanging. STEM: 1 inch long, 1/8 to

¼ inch thick; stuffed, then hollow; frequently compressed; smooth; tough; equal, tapering to the cap; flaky at apex, base often hairy; colour white or whitish. Odour and taste mild and pleasant, excelled by few others.

This plant is common on decaying leaves along woods, but is also found on lawns and in pastures, from September to November.

Clitócybe gigántea (Sow.) Quel.

SHORT-STEM GIANT CLITOCYBE

(Pl. 21)

EDIBLE

Wandering through open woods and fertile meadows from August to October, one's attention is often attracted by the immense size of the white-platter-like caps of a fungus with a very short, stout stem. *Clitocybe gigantea* is truly the giant amongst this genus, if not amongst gill fungi.

CAP: from 6 to 10 inches in diameter; white to tan in colour. Its surface is smooth when moist, but when dry appears to be covered with a very minute, flaky down. It is at first strongly incurved, later expanding until more or less platter- and occasionally funnel-shaped. MARGIN: thin, frequently splits and then turns up. FLESH: white; firm; frequently very moist (absorbing water). STEM: often not more than an inch in length, of the same or greater thickness; colour dirty white; smooth or with a felty down towards the swollen base. GILLS: whitish to cream, in old specimens turning tawny to yellow; very crowded, frequently branched, narrow or broad, and not nearly so decurrent as in other species of this genus.

It grows singly or in associated groups of two and more, and is most conspicuous by its size. From August to October.

Clitócybe illúdens Schw.

JACK-MY-LANTERN

(Pl. 22, Fig. 1)

POISONOUS

CAP: fleshy; frequently large, ranging from 3 to 5 inches wide; smooth; convex at first, and has an elevation in the centre (umbonate). Old specimens are often depressed in the centre. The rich saffron-yellow colour of the entire plant is a striking feature of this species. The MARGIN of the cap often becomes wavy. The flesh is soft and white or yellowish in colour. GILLS: somewhat close, broad, and extend down the stem for some distance. The colour is the same as the cap. STEM: from 3 to 5 inches long ½ to ⅝ inch thick; solid; smoothly firm; and tapers towards the base.

It usually grows in large clusters at the base of decayed stumps, from August to October.

CLITOCYBE GIGANTEA
(One-half natural size)

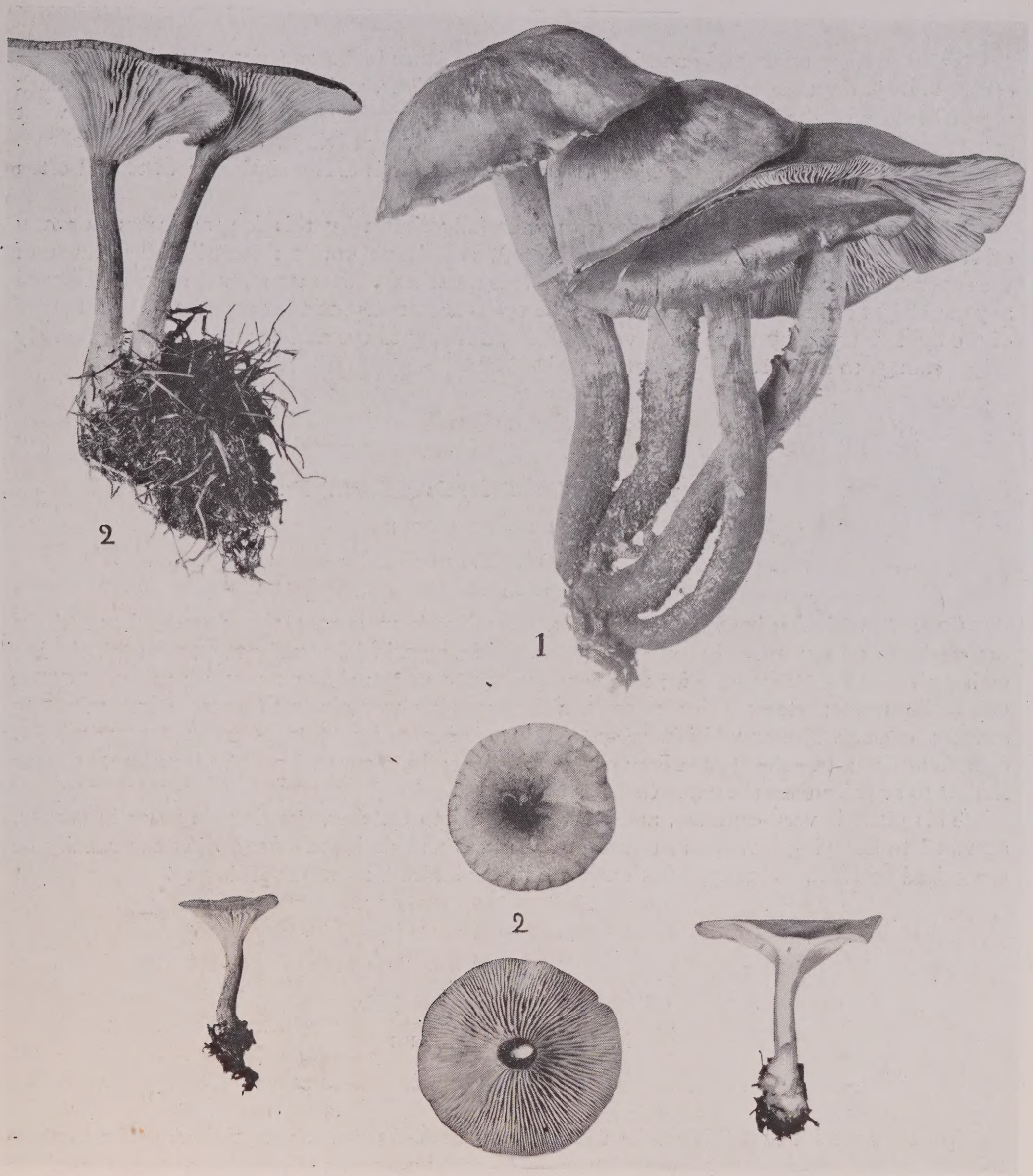


Fig. 1. CLITOCYBE ILLUDENS
Fig. 2. CLITOCYBE INFUNDIBULIFORMIS

This is a truly remarkable and interesting plant. Once its large clumps have been found—conspicuous in daytime by their bright saffron-yellow colour, and wonderful to behold on dark nights because of the luminescence of the entire plant—it will never be forgotten. On what grounds the author called this beautiful plant "illudens" (deceiving), we cannot comprehend. Perchance because, notwithstanding its innocent beauty, it is disappointing in taste and often seriously injurious when eaten.

The phenomenon of luminescence so wonderfully shown by this fungus occurs in many other forms of fungi (*Armillaria*, *Panus*, etc.), and is no doubt responsible for much of the superstitions attached to fungi generally. It is a natural phenomenon, and may be observed any dark night or in a darkened room once the eye is accustomed to the darkness. The intensity of the light given off by these fungi varies often according to age and condition. It is generally bright enough to affect sensitive photographic plates.

Clitócybe infúndibulifórmis (Schaeff.) Fr.

FUNNEL-SHAPED CLITOCYBE

(Pl. 22²)

EDIBLE

CAP: 2 to 3 inches broad; convex and at first slightly umbonate, then depressed or entirely funnel-shaped; dry; smooth; often irregular. Colour variable, usually tan to reddish, fading with age. MARGIN: even; thin; frequently wavy. FLESH: thin on margin; white. GILLS: deeply decurrent; close; thin; narrow, and narrowing towards both ends; edges minutely serrate; colour white or whitish. STEM: 1½ to 3 inches by ¼ to ½ inch; spongy within, externally firm; tapering to the cap; smooth; pliant; base covered with white down. Colour similar to or paler than the cap. ODOUR: agreeable.

This plant is very common, and lasts from July to October, growing singly or in groups, attached to decaying leaves and refuse in coniferous and deciduous woods. It can readily be recognized by its funnel-shaped form and the light pinkish-buff colour of its cap.

Clitócybe laccáta (Scop.) Fr.

LACQUERED CLITOCYBE

(Pl. 23)

EDIBLE

We have retained for this species the generic name *Clitocybe*. Some authors prefer to place this and related species into a separate genus, to which the name *Laccaria* has been given. It includes all species with the typical, broad, mealy, and pulverulent gills, so characteristically shown in this species.

CLITOCYBE LACCATA

This plant is more common than the preceding, and varies greatly both in shape and colouring. CAP: fleshy, rather thin; at first convex, later expanding to nearly plane. It ranges in width from 1 to 2 inches. The surface may be even or it may be depressed in the centre (umbilicate). Sometimes it is smooth, or is covered with a matted, woolly substance (tomentum), resembling scales. When the cap is moist it is almost transluscent; when dry the colour varies from flesh to dull yellow and to reddish-violet. FLESH: thin; soft; flesh colour. GILLS: vary both in shape and colour. They are very coarse, broad, distant, attached to the stem the entire width (adnate), or decurrent. The colour is rather constant, rose to flesh. The white spores of this species frequently adhere to the gills, resulting in the characteristic floury or mealy condition. STEM: tough, fibrous; varying in length from 1 to 4 inches. It is generally crooked, often twisted, slender; firm; and internally filled with a soft, pithy substance. In width it is from 1/8 to 3/8 inch thick; and of a reddish-flesh, often purple, colour.

This species is common, and is found over a wide range. It grows in pastures or woods, from June to November. Although edible, the flesh is tough and of poor flavour.

Clitócybe mûlticeps Peck.

CLUSTERED CLITOCYBE

(Pl. 24)

EDIBLE

This plant is common from July to October, growing in large, crowded clusters composed of many individuals. CAP: at first hemispherical, but when mature nearly plane, often very irregular from being crowded; width from 2 to 4 inches. The surface is moist; smooth or somewhat silky to the touch. MARGIN: thin and acute, and generally turned in (involute). The colour varies from greyish, sordid white or light cream, to brownish-grey or buff. FLESH: spongy; thick; white. GILLS: white; crowded; thin; adnate to slightly decurrent. STEM: solid or stuffed; tough; elastic; equal or slightly tapering to the cap. It is of the same substance as the cap and continuous with it. The upper part is covered with a light bloom (pruinose). It varies in length from 2 to 5 inches by 1/4 to 1/2 inch thick; and is white or sordid white.

This plant grows in open places or beside logs or stumps, frequently in long grass of vacant city lots. It is edible, but rather insipid, though many consider it excellent.

Clitócybe nebuláris (Batsch) Fr.

CLOUDY CLITOCYBE

(Pl. 25)

EDIBLE

So called because of the patches of mottled grey appearing on the cap, which are easily rubbed off. CAP: from 4 to 5 inches in width; convex, becoming nearly plane; smooth and silky to the touch. In colour it varies from creamy-fawn to biscuit, or pinkish-fawn to a

CLITOCYBE MULTICEPS

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CLITOCYBE NEBULARIS

tint of flesh. MARGIN: thin; wavy, very much incurved, covered with fine, grooved markings (striations). FLESH: spongy; white; thick in the centre, thin at margin. GILLS: white; narrow; thin; close together, partly attached to and running down the stem. STEM: solid in the upper portion, but at the base it becomes pithy (stuffed); slightly tapering to the cap. It is generally thin, but a form occurs in which it is from ½ to ¾ inch wide, length 1 to 2½ inches; and of uniform white colour.

Generally found late in fall in shaded woods, growing singly among leaves. The raw fungus is acrid in taste, which is persistent, but disappears on cooking.

Clitócybe ochropurpúrea Berk.

PURPLE-GILLED CLITOCYBE

(Pl. 26)

EDIBLE

CAP: violet or purple in young specimens, turning tawny yellow when older; from 2 to 4 inches wide; at first convex and covered with a fine, closely adhering, soft, felty down, the surface becomes smooth on expanding, often depressed in the centre, then cracks into areas forming coarse scales when old. It is tough and fleshy, with margin strongly incurved, smooth, and rather thick and wavy. FLESH: firm; thin; compact. This species is readily recognized by the unusual colour of the gills, which is dark purple. They are thick; distant; broad towards and squarely attached to the stem, with a plain notch or slightly decurrent with a tooth. STEM: variable in shape; solid, tough, fleshy; and surface often marked with grooves and covered with fine fibrils; equal or tapering to the cap, often enlarging towards the cap and of the same substance. The colour is purplish, changing to brownish, becoming lighter at the base. The stem is from 3 to 4 inches long, and ½ to 1 inch thick.

It grows singly, in thin woods, among leaves and grass, in clay soil, during July and August.

Some authors include this species in the genus *Laccaria*.

Clitócybe odóra (Bull.) Fr.

FRAGRANT CLITOCYBE

EDIBLE

CAP: 1 to 3 inches broad; thin; convex, becoming plane, slightly wavy, even; smooth; silky when dry; grey-green to bluish-green, ofter paler. MARGIN: incurved and pliant, slightly striate. FLESH: tough; thick; white. GILLS: adnate-decurrent, close, broad; greenish to whitish. STEM: 1 to 1½ inches long, ⅛ inch more or thick; stuffed, then hollow; equal or slightly tapering to and pruinose at apex; base prominently downy; colour variable, white, or

CLITOCYBE OCHROPURPUREA

CLITOCYBE PICEINA

with greenish tint. ODOUR: pleasant, spicy, anise-like, especially when dry. TASTE: rather strong when cooked, but not unpleasant.

It grows in clumps, in coniferous and deciduous woods, from August to October.

This plant may be readily distinguished by its agreeable, spicy odour, its bluish-green cap, and greenish gills.

Clitócybe piceína Peck.

LONGER-STEM GIANT CLITOCYBE

(Pl. 27)

EDIBLE

This is another large and most robust species in this genus. CAP: from 3 to 7 inches wide; fleshy; firm; very irregular in shape, being at first convex, and as it grows the margin remains incurved for a long time, afterwards becoming wavy and depressed in the centre in old specimens. The surface is dry and dull in appearance, smooth or covered with fine silky hairs. The colour is an opaque white, sometimes having a slight tint of fawn in the centre in old specimens. FLESH: firm; compact; thick in the centre but thinning out at the margin; and white in colour. GILLS: close to each other, narrow, some attached to the stem, others running slightly down, margins slightly eroded; colour whitish to yellowish. STEM: solid; tough; thick, swollen at the base and tapers to the cap when young; of the same substance as the cap. When old it frequently is much larger at the top, then it tapers to the base. The surface is coarsely fibrous, or may be covered with fine, white, silky strands. The colour is like the cap—opaque white. It varies from 1½ to 3 inches in length and diameter from ¾ to 1 inch, and in old specimens may run from 1 to 2 inches in diameter.

It grows commonly in dense clusters, in long grass under pines from September to October, and is one of the best for the table.

Genus 7

Cantharéllus Adanson

Plants prominent by their yellow colour, often deep yolk. Cap and stem continuous, fleshy. Cap top or funnel-shaped, with wavy, lobed, or inrolled margin. The gills have a blunt, almost rounded edge, are shallow, fleshy, and profusely branched in a fork-like manner, slightly paler than the cap and extending down the stem. The stem is central, and bears neither ring nor volva.

Cantharéllus aurantíacus (Wulf.) Fr.

ORANGE-YELLOW CHANTERELLE

(Pl. 28, fig. 1)

DOUBTFULLY EDIBLE

CAP: 1 to 2½ inches wide; fleshy; pliant; convex to expanded, often funnel-shaped; smooth or covered with minute, hairy fibrils; orange-yellow to brownish-orange, centre darker. MARGIN: at first incurved, often upturned when old, and wavy. FLESH: soft, spongy; thick at

Fig. 1. CANTHARELLUS AURANTIACUS
Fig. 2. CANTHARELLUS CIBARIUS

centre, thin at margin; taste mild; colour pale yellow. GILLS: extending down the stem, crowded, repeatedly branched, like the prongs of a tuning fork; thin; edges blunt; close; rather narrow; orange or yellowish. STEM: 1 to 2 inches long, ¼ to ½ inch thick; spongy within, sometimes hollow; fibrous; tapering to the cap; ochre yellow.

Growing close to each other on the ground or on decayed wood, from July to September.

Opinions in regard to taste and edibility vary greatly. Some regard it positively as suspicious, others as of unpleasant taste, while still others consider it edible. We have not eaten this species.

Cantharéllus cibárius Fr.

THE CHANTERELLE

(Pl. 28, fig. 2)

EDIBLE

CAP: 1½ to 3 inches wide; fleshy; smooth; firm; top-shaped, convex, becoming nearly plane, irregular to distinctly lobed, slightly depressed in the centre, uneven; colour egg-yellow. MARGIN: thin; incurved at first, becoming expanded, wavy, upturned when old. FLESH: thick; compact; yellowish. GILLS: extending down the stem; distant; thick; narrow; edges blunt, forked or united by transverse veins; colour yellow. STEM: often decidedly lateral; 1 to 2 inches long, ⅓ to ¼ inch thick; solid; firm; flexible; equal or slightly tapering to the base; same colour as gills. ODOUR: fragrant and most pleasant.

A common species, growing on the ground in coniferous woods, singly or in scattered groups, during July and August. This is the famous chanterelle of ancient Rome, and a great favourite in Europe on account of its pleasant, nutty flavour and great abundance.

It is distinguished from *C. aurantiacus* by the more distant and long decurrent gills, with fewer branches, and by its smooth surface and much firmer flesh.

Cantharéllus cinnabarínus Schw.

VERMILION-RED CHANTERELLE

EDIBLE

CAP: ½ to 1½ inches broad; often irregular; firm; convex or slightly depressed in the centre; smooth; frequently with a wavy or lobed margin; vermilion red, fading when older. FLESH: thin; white to cream, tinged reddish under the cuticle. GILLS: deeply decurrent, narrow, distant, forked; varying in colour from red-yellowish to pinkish. STEM: ¾ to 1½ inches long ⅛ to ¼ inch broad; solid, sometimes stuffed; circular in section or flattened at apex, equal or tapering to the base; fleshy; tough; smooth; red or paler. Odour and taste mild; when fresh the plant is often tardily acrid.

It grows scattered or in small groups in, or alongside, open woods, from July to October. Its bright red colour and small size distinguish it readily from related species.

Fig. 1. LACTARIUS DECEPTIVUS

Fig. 2. LACTARIUS DELICIOSUS

Genus 8

Lactárius Fr.

MILKY CAP

Almost throughout brittle plants, readily distinguished from fungi of similar size, shape, and colour by the exudation of a milky, cloudy juice, which oozes freely from any broken or damaged portion. This juice is generally white, but in some species changes in colour on exposure to air, becoming yellow, red, or violet. The gills are particularly milky. The taste of the milk frequently aids in distinguishing species, and should be noted. It may be mild at first, then peppery and acrid, which taste may persist in one's mouth for some time. On cooking they become mild.

Russula, a genus resembling *Lactarius* rather closely, never shows the characteristic fluid, even though occasionally a trace of a clear, serous fluid may be observed in the former.

The cap is fleshy, firm, usually depressed in the centre and often marked with concentric rings or zones, distinctly different in colour from the cap. The gills are unequal, rigid, brittle, adnate or decurrent, branched or not. The stem is stout, central, brittle, spongy internally or hollow, tapering gracefully towards base, not separable from the cap, and of the same consistency. Ring and volva lacking. Usually very beautiful, and prim in appearance, including some very good edible species.

It has long been our endeavour to aid the amateur interested in fungi by supplying a suitable popular term by which the various fungi may be known. In the case of *Lactarius* we suggest the name Milky Cap, which suitably describes the characteristics of this genus.

Lactárius camphorátus (Bull.) Fr.

SCENTED MILKY CAP

EDIBLE

CAP: ½ to 2 inches broad; convex; rigid but very fragile; fleshy; thin; often umbonate, becoming expanded, at length depressed; dry; smooth; faintly zoned; often wrinkled and uneven; brick-red to brown. MARGIN: uneven, upturned when old. FLESH: thin; fragile; aromatic; reddish. GILLS: adnate-decurrent, crowded, narrow, a few forked near the stem; dull yellowish to reddish-brown. STEM: 1 to 2 inches long, ¼ to ⅜ inch thick; equal or tapering to base; smooth or pruinose; wrinkled; often compressed; spongy-stuffed; of the same colour as the cap. MILK: cloudy white; plentiful; mild; in dry weather scant and watery. Odourless at first, when drying strongly aromatic, similar to chicory.

This plant may be easily recognized by its aromatic odour when dry and its dark reddish-brown colour.

It grows on the ground in moist places, on much decayed wood in mixed woods, and is common during July and August.

LACTARIUS HYGROPHOROIDES

Lactárius deceptívus Pk.

COTTONY-MARGINED MILKY CAP

(Pl. 29, fig. 1)

EDIBLE

CAP: 3 to 6 inches broad; compact; at first convex and umbilicate, then expanded and centrally depressed or somewhat funnel-shaped; dry; smooth except on the margin, which is at first involute and covered with a dense, soft, cottony tomentum, then expanding and becoming upturned; surface white or dirty white, often spotted rusty or brownish. FLESH: compact; thick; white. GILLS: adnate or decurrent, broad, distant, a few forked; white or cream. STEM: 1 to 3 inches long, ½ to 1½ inches thick; solid; stout, short, equal or tapering to the base; covered with a bloom or with short, soft, downy hairs; colour white. MILK: acrid, unchanging; white.

Growing in numbers in woods and open places, especially under hemlocks, common from July to September.

This is one of the coarser species, but meaty. It loses its peppery taste in cooking. It resembles *L. vellereus* closely, from which it differs in having the inrolled margin cottony while the rest of the cap is smooth. In the former the entire surface is minutely tomentose or cottony.

Lactárius deliciósus (L) Fr.

DELICIOUS MILKY CAP

(Pl. 29, fig. 2)

EDIBLE

CAP: 3 to 4½ inches across; fleshy; convex, when young depressed in the centre, becoming expanded and funnel-shaped; viscid when moist; fragile; surface covered with concentric rings or zones generally well marked, sometimes indistinct or wanting; turning green where bruised; colour orange-red, yellow-orange, or mottled with varying shades, often greenish. FLESH: soft, spongy, brittle; white, with a decided orange tint. MILK: copious; mild to acrid; orange to orange-red, or saffron, changing to green. GILLS: run down the stem, in older specimens close, narrow; thin; brittle; occasionally inconspicuously veined; some forked at the stem; saffron, with frequent green stains. STEM: 2 to 3 inches long, ½ to ¾ inch thick; at first spongy within, then hollow; brittle; flexible; equal or slightly tapering to the base; at first covered with a frost or bloom; spotted with orange, and turning green where touched; of the same colour as the cap.

This is usually referred to as one of our best edible varieties, and has a wide range or habitat. We cannot agree that its taste is delicious; we found it rather insipid whenever tried. It is an easy plant to determine, and its mottled orange cap is conspicuous in the woods wherever it grows. It is found in damp woods, especially under coniferous trees, from July to November.

LACTARIUS HYSGINUS

Lactárius hygrophoroídes B. et C.

WATERY MILKY CAP

(Pl. 30)

EDIBLE

So called because of its resemblance to the genus *Hygrophorus*, a type of fungus translucent in appearance, as if watery or soaked.

CAP: 1 to 3 inches broad; fleshy; convex, depressed in the centre, becoming expanded, frequently funnel-shaped. The surface is dry, minutely velvety, and has a persistent bloom. The colour is yellowish-red or orange. MARGIN: thin; slightly wavy; smooth; acute. FLESH: thick, compact; whitish; unchanging. MILK: copious; white; mild in taste. GILLS: adnate in the young specimens, decurrent when old; distant; thin; narrow; veined within the spaces between the gills; brittle; cream, not changing in colour. STEM: 1 to 2 inches long ⅓ to ½ inch thick; solid; equal or tapering to the base; covered with a bloom; tough; of the same substance as the cap; colour tawny-orange.

It is not common, and grows in moist woods during July and August.

Lactárius hýsginus Fr.

FLESH-COLOURED MILKY CAP

(Pl. 31)

EDIBLE

CAP: 2 to 3 inches broad; fleshy; convex, becoming plane, depressed in the centre, often with a slight umbo, frequently with zones darker than the rest of the cap; rigid; even; sticky when moist; dry; dull; firm. The colour ranges from flesh to chestnut, or nut-brown to blood or brownish-red. MARGIN: thin; smooth; often wavy, frequently depressed on one side only. The extreme edge is acute and slightly turned in. FLESH: soft but firm; thin; brittle; white. MILK: white in colour; unchanging; and very peppery. GILLS: attached to the stem, some slightly decurrent, close, rounded at the stem end, an occasional one forked at the stem. They are thin; narrow; many of them short; colour whitish or cream, changing to light yellow when old. STEM: 2 to 2½ inches long ⅜ to ½ inch thick; spongy within, frequently becoming hollow; tough; equal or tapering to the cap, cylindrical, flexible; colour reddish-brown same as cap, often a little paler.

This species is not common. It grows singly, in open mixed woods, from July to October. The pungent taste entirely disappears when cooked.

Fig. 1. LACTARIUS INDIGO
Fig. 2. (All others) LACTARIUS PIPERATUS

Lactárius índigo (Schw.) Fr.

INDIGO MILKY CAP

(Pl. 32[1])

EDIBLE

CAP: 2 to 5 inches broad; convex, depressed in the centre, expanding but not plane, often shallow funnel-shaped; tough; fleshy; with margin much incurved. The entire plant is a rich indigo, with a colourless cuticle, giving to it a silvery lustre. Concentric zones of a darker blue are prominent in young plants, but fading in the old. FLESH: firm; thick; sky-blue. MILK: mild; copious; unchanging in colour, blue. GILLS: attached to the stem, some decurrent, close, broad, some forking near the stem; colour indigo, becoming greenish with age. STEM: 1 to 2 inches long, ½ to ¾ inch thick; hollow; tough; smooth; equal or tapering to the base; spotted with blue, or coloured like the cap.

This species is unlike any other; the striking blue colour will at once arrest the attention of the collector, and serve to identify it. It grows singly, and is not common. It is found under pines or in mixed woods at the end of July and during August.

Lactárius piperátus (Scop.) Fr.

PEPPERY MILKY CAP

(Pl. 32, fig. 2)

EDIBLE

CAP: 3 to 5 inches broad; fleshy; rigid; convex, depressed in the centre when young, becoming funnel-shaped; zoneless; at first incurved; smooth; even; dry; colour white. FLESH: compact; unchanging; thick; white. MILK: white; unchanging; plentiful; pungently peppery. GILLS: extending down the stem, crowded, very narrow, thin, repeatedly branching, narrow at the stem end, at first bow-shaped, then extending as the margin of the cap turns upward; colour white or creamy-white, often yellow spotted. STEM: 1 to 3 inches long, 1 to 1½ inches thick; solid; firm; equal; dry; often with a bloom; white.

Its excessive peppery taste is lost in cooking. It is coarse, and of medium flavour. At the season this species is found there are always many species surpassing it in flavour, and it scarcely repays the trouble of cooking. It is found in woods and grassy places from July to October.

A variety of this species is known as—

Lactarius piperatus var. *pergamenus* (Swartz.) Quel.,

which is very similar in its general appearance, but differs from the other type by its gills, which, as will be seen in our photograph, are exceedingly crowded in *L. piperatus*, while in the variety *pergamenus* they are much coarser and wider apart, also less forked. The cap of the latter also shows a more parchment-like condition, and the stem is thinner.

LACTARIUS TORMINOSUS

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Lactárius torminósus (Schaeff.) Fr.

CORAL-COLOURED MILKY CAP

(Pl. 33)

DOUBTFULLY EDIBLE

CAP: 2 to 4 inches wide; convex, becoming depressed in the centre, finally turning funnel-shaped. It is viscid when young; smooth in the centre; dull; firm; often marked with flesh-coloured zones; fleshy. The colour is like pink coral, with a darker buff to strawberry tint. MARGIN: thin; at first incurved, often wavy; and conspicuously covered with a thick, persistent, hair-like fringe. FLESH: firm; thick; unchanging; white or tinted flesh colour. MILK: scanty; unchanging; very peppery; white. GILLS: attached to the stem, often with a decurrent tooth, close to each other; thin; narrow, some forked near the stem; colour at first whitish, changing to yellowish-flesh. STEM: 1 to 2½ inches long, ½ to ¾ inch thick; spongy within, becoming hollow; equal, or tapering to the base; fibrous; at first covered with a bloom; colour flesh, becoming lighter, frequently spotted.

This species has an inviting appearance; the coral-pink tint, woolly margin, zoned surface, and peppery taste are distinguishing features. It grows in damp, coniferous woods, generally in scattered groups, from August to October.

This plant is viewed with suspicion by some observers, and, as its specific name implies, is said to produce colic. To our personal knowledge the species has been eaten and enjoyed without causing any trouble.

Lactárius triviális Fr.

PURPLISH-LEADEN MILKY CAP

(Pl. 34)

DOUBTFULLY EDIBLE

CAP: 3 to 6 inches broad; convex, becoming plane, slightly depressed in the centre; viscid when moist; never zoned; shining; colour variable, pallid-dingy-brown, dark tan or smoky grey, lilac-purple, lead coloured or tawny pink. MARGIN: thin; smooth; remaining involute for a long time, often slightly wavy; acute. FLESH: soft; thick at centre, very thin at margin; whitish; unchanging. MILK: copious; cream to white; unchanging; acrid. GILLS: adnate, often with a decurrent tooth, close, a few forked at stem end, unequal in length; thin; broad; colour white, changing to pale straw. STEM: 2 to 3 inches long, ¾ to 1 inch thick; at first spongy within, becoming hollow; smooth; shining; equal; colour shining opaque white.

This species is common after rains. It is found growing among leaves under beeches, from July to October.

We have not eaten this species; others say it is not poisonous, though suspected.

LACTARIUS TRIVIALIS

Lactárius velléreus Fr.

FLEECY MILKY CAP

(Pl. 35)

EDIBLE

CAP: 3 to 5 inches wide; convex, becoming expanded then centrally depressed; fleshy; dull; dry; the entire surface covered with soft, fine, fleecy hairs, producing a velvety appearance; colour white or whitish, often greyish tinted. MARGIN: thin; involute, often becoming reflexed, acute. FLESH: compact; thick; unchanging; white. MILK: occasionally absent, when present very peppery; unchanging; white. GILLS: attached to the stem, many of them forked, fairly wide apart, narrow; thin; colour white, changing to light cream, turning brownish where injured. STEM: 1 to 2 inches long, ¾ to 1 inch thick; solid; rigid; equal or slightly tapering to base; covered with a velvety bloom; white.

This species is found in mixed, open woods, from August to October.

Lactárius volémus Fr.

GOLDEN-TAWNY MILKY CAP

(Pl. 36)

EDIBLE

CAP: 2 to 5 inches broad; convex, then expanded, often with a small umbo, when old slightly depressed in centre; somewhat wrinkled; without zones; dry; firm; golden-tawny or brownish-orange. MARGIN: at first involute, then spreading. FLESH: compact; rigid; white, turning brown on exposure to air. GILLS: adnate or slightly decurrent, close, moderately broad; white or yellowish, often tinged with same colour as the cap or lighter, sometimes becoming darker, turning brownish where bruised. STEM: 1½ to 4 inches long, ¼ to ¾ inch thick; solid; sub-equal; coloured like the cap, but lighter. MILK: white; unchanging; abundant; mild; sticky as it dries. Odour and taste pleasant.

Gregarious or scattered. It occurs in damp woods, and is common from July to September.

Genus 9

Rússula Fr.

In its general appearance the species of this genus resemble the preceding *Lactarius*, from which it differs in containing no milky juice, although some species exude a scanty amount of a clear, serous liquid. Since there exist a few species of *Lactarius* that have scanty milk or are without any altogether, care should be taken not to confuse the species.

Microscopically it is readily distinguished from *Lactarius* by the peculiar vesiculous structure of the substance of the cap. This condition gives to the flesh of the cap a characteristic brittle texture somewhat akin, on breaking, to that of a very soft-fleshed apple. Other more

LACTARIUS VELLEREUS

constant features are the regular, stiff, firm condition of the entire plant, and the central stem, continuous with the cap and without ring or volva. The gills are variably attached, from adnate to very slightly decurrent, broadening towards the margin. The margin is not usually curved inward, and is quite thin, hence frequently striate. The spores are white, often creamish or darker. The taste is either pungent, mild, or absent.

For a long time several species in this genus were considered poisonous, but we have the authority of the veteran mycophagist, McIlvaine, as follows: "To this genus authors have done special injustice; there is not a single species among them known to be poisonous, and where they are not too strong of cherry bark and other highly flavoured substances they are all edible"; which we readily confirm.

Rûssula atropurpûrea (Krombh.) Maire.

PURPLE-BLACK RUSSULA

(Pl. 36A)

EDIBLE

CAP: 3 to 4 inches broad; at first convex, soon expanding and depressed in the centre; firm to soft and flexible; even; colour varying from reddish-purple to dark purple, deeper coloured in the centre, opaque, not shining; slightly viscid, soon dry and velvety. MARGIN: thin; even or slightly striate. FLESH: white, greyish or greyish-purple under the cuticle. Odour slight and taste mild. GILLS: adnexed, nearly equal, fairly distant, interspaces veined, a few forking near stem; white to yellowish, when bruised turning brownish. STEM: 2 to 3 inches long, 3/8 to 3/4 inch thick; white; equal; smooth; inside spongy; turning brownish where bruised.

It is found in open woods, either solitary or in groups, from July to September, sometimes in great abundance.

Rússula délica Fr.

ZONED-STEM RUSSULA

(Pl. 37)

EDIBLE

CAP: 3 to 6 inches broad; firm; convex-umbilicate, becoming funnel-shaped; dry; smooth; even; not polished; dull white or chalky white, covered with rusty-brown stains; cuticle not separable. MARGIN: thin; not striate; often incurved, upturned when old. FLESH: white; firm; compact; unchanging. GILLS: faintly decurrent; fairly distant; short and long alternating, a few forked; exuding clear, watery drops of moisture, thus likely to be confused with *Lactarius;* narrow; thin; diminishing towards stem; colour white. STEM: 1 to 2 inches long, 1/2 to 3/4 inch thick; solid; tough; firm; rigid; glabrous; equal or slightly tapering to base; stained. The narrow, pale-green zone at the apex should aid in determining this species. The stem is often covered with short, matted hairs. Odour none, and taste mildly acrid.

It is a large, coarse species, growing in sandy soil, in mixed woods, sometimes very plentifully, from July to October.

LACTARIUS VOLEMUS *(Photo. courtesy of C. L. Shear, Washington, D.C.)*

RUSSULA ATROPURPUREA

(Photo. courtesy of J. E. Bishop, Washington, D.C.)

RUSSULA DELICA

Rússula densifólia (Secr.) Gill.

CLOSELY-GILLED RUSSULA

(Pl. 38)

EDIBLE

CAP: 3 to 4 inches wide; fleshy; firm; at first convex, becoming nearly plane, depressed in the centre; viscid when moist; fragile; smooth; colour dark greyish-brown or sooty olive, turning black when old. MARGIN: thin; wavy; smooth; generally turned in, but with age frequently upturned. FLESH: soft; thick at the centre; brittle; at first greyish-white, turning red, finally black, when bruised. GILLS: attached squarely to the stem or slightly decurrent; often rounded behind; close to each other—hence the name—some forked near to stem; of unequal length; thin; broad; brittle; white at first, turning reddish then black when wounded. STEM: 1½ to 2 inches long, ¾ to 1 inch thick; solid; more or less spongy internally; even; colour white at first, turning blackish on handling. The taste is mild at first, but soon becomes very peppery.

This plant is not common. It grows beneath pines and spruce in open woods, and is found during July and August.

Rússula emética (Schaeff.) Fr.

FUNGENT RUSSULA

(Pl. 39)

EDIBLE

CAP: 2 to 3 inches broad; fleshy; convex, becoming expanded and slightly depressed in the centre; viscid when moist; smooth; quite brittle. The cuticle peels off readily from the cap, exposing the faintly red surface of the flesh immediately underneath it. The remainder of the FLESH is white, and very pungent to the taste. The colour of the cap is bright to deep red, paling when old. MARGIN: deeply striate; coarsely granular; at first incurved. GILLS: white; rounded at the stem end, and partly joined to it; broad; of equal length; not crowded; with an occasional one forked close to the stem. STEM: 2 to 3 inches long, ½ to ¾ inch thick; solid or may be stuffed with a pithy substance; stout; smooth; fragile; frequently wide at the middle, and tapers to an abrupt, rounded base; pure white or tinged with red.

This *Russula* is common from July to October, and is found growing in woods or on rotten logs. For many years and by numerous observers this species has been regarded as positively poisonous, with all kinds of modifications, such as emetic, suspect, etc., etc. The fungus has been eaten frequently in large quantities, by many persons, who have thoroughly enjoyed it.

RUSSULA DENSIFOLIA

RUSSULA EMETICA

Rûssula foétens (Pers.) Fr.

FETID RUSSULA

(Pl. 40)

DISAGREEABLE

CAP: 3 to 6 inches broad; fleshy; firm; thin; fragile; at first hemispherical, becoming nearly plane, depressed in the centre; viscid when moist. The cuticle is separable at the margin. The colour ranges from honey-colour or dingy yellow to reddish-brown. MARGIN: thin at first; incurved; and widely grooved by broad striations, which are longer than in any other species. The grooves are granular. FLESH: thin; rigid; yellowish next to the skin, otherwise white, later turning brownish. Odour very unpleasant and taste acrid. GILLS: partly joined to the stem; broad; close to each other; many forking near the stem, others farther away from it. The interspaces are joined by veins. Most of the gills reach the stem, but many are shorter. They are white, turning yellow with age, and when bruised change colour to reddish-brown, at first exuding watery drops. STEM: 1½ to 3 inches long, ½ to 1 inch thick; stout; hollow, or it may be composed of a pithy substance; colour whitish, turning umber where bruised.

This plant is common, and easily recognized. It grows in mixed woods and in bushy places, occurring from July to October. It is not a poisonous species, but its strong odour and unpleasant taste are decidedly against it.

Rûssula lûtea (Huds.) Fr.

LEMON-YELLOW RUSSULA

(Pl. 41)

EDIBLE

CAP: 2 to 3 inches wide; fleshy; firm; convex, becoming plane, finally depressed in centre. The surface is even; smooth; viscid; colour bright yellow, often fading. MARGIN: thin; even, sometimes slightly wavy and striate. FLESH: soft; thin at margin; brittle; white; sweet and pleasant to the taste. GILLS: thin and broad; egg-yellow; free to attached; close to each other; many forked near the stem; surface of, and interspaces between, gills veined. STEM: white; 2 to 3 inches long, ⅜ to ½ inch thick; solid, becoming spongy in the interior; flexible; equal or slightly tapering to the cap.

This pretty mushroom is readily identified by its bright yellow cap. It grows singly or in patches, in thin, shady woods; and is found during the latter part of July and in August.

RUSSULA FOETENS

RUSSULA LUTEA

Rússula Máriae Pk.

MARY PECK'S RUSSULA

(Pl. 42)

EDIBLE

CAP: 2 to 3 inches across; at first hemispherical, then convex, becoming plane and slightly depressed in the centre; surface dry, covered with velvet-like bloom. The colour varies from bright pink-red or dark subdued red to purple, often slate-violet when growing in shaded places. MARGIN: thin; even; smooth; and much incurved when young. It frequently becomes striate when mature, the ridges between the striations being granular. FLESH: thin; compact; unchanging in colour, white. GILLS: joined to the stem; equal; and close to each other. Some of them are forked near the stem, narrow at the inner end, broader at the outer, and connected with veins. The colour is white, then cream. STEM: 2 to 3 inches long, ½ to ¾ inch thick; solid; stout; equal or slightly tapering to the base, rigid; finely striate. The colour is usually a tint of pink, the base white.

This is a pretty species, and is one of the best of the genus for food. It grows in shaded pastures or thin woods, generally in groups. It is found in July and August.

Rússula pectináta (Bull.) Fr.

COMB-EDGED RUSSULA

(Pl. 43)

EDIBLE

CAP: 3 to 5 inches broad; fleshy; and much incurved till it becomes expanded, slightly depressed in the centre; viscid at first; fragile; generally smooth; and darker at the disk; colour dingy yellow, or yellowish-brown to cinnamon-brown. MARGIN: thin; often irregular, deeply furrowed like the teeth of a comb; with the ridges coarsely granular. FLESH: very thin, especially at the margin; and whitish in colour, yellow-stained below the cuticle. The taste is slightly acrid. The skin is separable at the margin only. GILLS: slightly joined to the stem; close to each other; mostly equal, but many are forked at the stem; broad; turning brownish when bruised, colour pale-yellow to white. STEM: 2 to 3 inches long, ¾ to 1 inch broad; stout; filled with a spongy substance, finally becoming hollow. It is slightly striate; equal, or tapering a little to the base. In colour it is white.

The species is common, growing in grass, in groves and woods, from July to frost.

RUSSULA MARIAE

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RUSSULA PECTINATA

Rússula viréscens (Schaeff.) Fr.

GREEN RUSSULA

(Pl. 44)

EDIBLE

CAP: 2 to 5 inches broad; fleshy; globose, then becoming expanded and depressed in the centre; smooth; dry; cracking profusely, causing it to appear very patchy. The colour is from grey-green to dark-green, clouding when older. MARGIN: even, sometimes slightly striate when old. FLESH: thick; crisp; not very compact; mild. It is white in colour. GILLS: free or often slightly attached to the stem; white; rather close to each other; narrow at the stem end; very brittle. Some are forked, and are equal or have some short ones intermingled. STEM: 1 to 3 inches long, ½ to ¾ inch thick; striate towards apex; solid, often becoming spongy within; firm; equal; thick; pale-green to white.

This is a midsummer species, found during July and August. It appears singly, sometimes in patches, in woodland and grassland. The green cap and skin cracking into scales or warts cause this *Russula* to be readily identified. It is one of the best edible species.

Genus 10

Hygróphorus Fr.

The cap is fleshy, regular or wavy, viscid or dry, soft, often glassy and brittle, more or less brightly coloured, never covered with scales. The gills are thick, waxy or watery, distant, decurrent or squarely attached to the stem by their upper edge, or notched. The stem is central, fleshy, of same substance as and continuous with the cap. It has no trace of a true veil, ring, or volva, and never shows a scaly apex.

Species growing on ground, very rarely on wood.

Hygróphorus ceráceus (Wulf.) Fr.

WAXY HYGROPHORUS

EDIBLE

CAP: ½ to 1½ inches broad; convex, becoming plane, obtuse to bell-shaped; surface viscid; fragile; thin; yellow as the colour of wax, and fading. MARGIN: translucent; minutely striate. FLESH: fragile; same colour. GILLS: adnate to slightly decurrent; broad; distant; rather thick; connected by veins; slightly triangular in section; whitish or pale yellow. STEM: 1 to 2½ inches long, ⅛ inch or more in width; hollow; equal; straight; circular in section, often compressed; slightly viscid, soon dry; waxy-yellow to orange.

This species is small and frequent, yellow throughout, growing in groups in moist places, from August to October.

RUSSULA VIRESCENS

Hygróphorus chrýsodon Fr.

GOLDEN-TOOTH HYGROPHORUS

(Pl. 45)

EDIBLE

CAP: from 1 to 2½ inches broad; convex, becoming expanded; very viscid when moist; fragile; smooth; shining when dry. It is white in colour, with the disk a light lemon colour. The surface is covered with minute, light-yellowish dots, more plentiful and persistent at the margin, which is strongly incurved. FLESH: soft; thin; white. GILLS: run down the stem; distant; thin; white; connected by veins. STEM: 2 to 4 inches long, ¼ to ⅜ inch thick; spongy within; soft; even; white, and dotted minutely with light yellow, more pronounced at the apex, forming a light golden zone.

This plant is not as common as others of this genus. It is found on the ground under trees in open woods, during October. Its slimy cap and golden granules scattered over cap and stem readily identify it.

Hygróphorus cónicus (Scop.) Fr.

CONE-SHAPED HYGROPHORUS

(Pl. 46[1])

EDIBLE

CAP: 1 to 2 inches broad; prominently cone-shaped, not expanding; smooth; viscid; shining when dry; fragile; lobed or slightly wavy; colour very variable, yellow, sulphur-greenish, orange or orange-red, turning black when bruised. FLESH: thin; soft; yellow, changing to black on exposure to air. GILLS: adnexed, often free; ventricose; close; broad; thick; yellow or sulphur-yellow, turning blackish when old. STEM: 1 to 3½ inches long, ¼ to ⅜ inch thick; hollow; cylindrical; fibrous-striate; twisted; soft; dry; readily splitting longitudinally; sulphur or yellow, turning black when drying.

This plant is common, being found from early spring to October, growing in groups or solitary, in moist coniferous woods amongst fallen leaves. It may be easily recognized by its conical pileus and by any part of the plant turning black where touched or bruised.

Hygróphorus ebúrneus (Bull.) Fr.

IVORY HYGROPHORUS

(Pl. 46[2])

EDIBLE

CAP: 1 to 3 inches broad; fleshy; convex, becoming expanded, sometimes wavy; very glutinous in wet weather; shining; even; smooth; pure white, changing to ivory yellow. MARGIN: involute at first; downy. FLESH: white; sometimes thin. GILLS: adnate to decur-

HYGROPHORUS CHRYSODON

Fig. 1. HYGROPHORUS CONICUS Fig. 2.. HYGROPHORUS EBURNEUS

rent; distant; broader behind; frequently veined; white, turning dingy yellow. STEM: 2 to 6 inches long, ¼ to ⅜ inch thick; white, becoming yellowish; glutinous; stuffed or hollow; varying in length; equal or tapering to the base; frequently twisted; apex with white dots.

Growing singly or in clusters, in shady woods or grassy meadows. Its white cap and stem, covered when fresh with a sticky slime, enables one to recognize the plant without difficulty.

Hygróphorus praténsis (Pers.) Fr.

MEADOW HYGROPHORUS

(Pl. 47)

EDIBLE

CAP: from 2½ to 4 inches across; at first bell-shaped, then convex, becoming top-shaped frequently irregular; smooth; broadly umbonate, often split in the centre; varying in colour from white to shades of yellow, tawny to buff. MARGIN: thin; smooth; even or wavy, remains for a long time incurved. FLESH: thick, especially in the centre; spongy; flesh colour to pale orange. GILLS: sometimes attached to the stem, often with a decurrent tooth, at other times deeply decurrent; distant; thick; connected by veins; broader in the middle; colour same as cap. STEM: from 2 to 3 inches long, ⅜ to ½ inch thick solid, often becoming stuffed with a pithy substance; smooth; equal, tapering towards apex or base. The apex is covered with a white down when young.

This species is common, and is found growing in pastures or in thin or open woods. It sometimes grows in dense clusters, causing the caps to become flattened or distorted. It is a good edible species.

Genus 11

Pleurótus Fr.

This genus appears in various forms, but is readily recognized because, with very few exceptions, it grows on tree trunks or logs. Furthermore, the species are usually fan-shaped. It has a short, stout, solid stem, which is of the same substance as the cap and continuous with it. It may be excentric or lateral, sometimes very rudimentary. The prominent gills are joined to the stem in a few species, but generally decurrent in a conspicuous manner.

Pleurótus ostreátus (Jacq.) Fr.

OYSTER MUSHROOM

(Pl. 48)

EDIBLE

CAP: 2 to 6 inches broad; firm; fleshy; smooth; moist; convex or slightly depressed behind, later expanding, shell or fan-shape. STEM: always lateral; short; stout; curved; white to yellowish; base hirsute; often almost absent. Growing in shelved clusters, often overlapping.

HYGROPHORUS PRATENSIS

PLEUROTUS OSTREATUS

The colour varies from dark olive-tawny when young, to buff-grey, fawn or white. FLESH: thick; soft when young, tough when old; white to cream. GILLS: extend down the stem; close to fairly distant; coarse; often ragged edges; united by veins or partitions; white to light yellow.

This is one of our common edible species, found from June to November. *P. sapidus* is a closely related species, if not a variety of it, and may be distinguished by its lilac-coloured spores when seen in mass.

Pleurótus serótinus (Schrad.) Fr.

OLIVE PLEUROTUS

(Pl. 49)

EDIBLE

CAP: 1 to 3 inches broad; fleshy; compact; convex, becoming nearly plane; kidney-shaped or partly round; viscid when young, and moist. Caps sometimes confluent, usually solitary or shelving. The colour is olive or yellowish green with a brownish tint. FLESH: soft, spongy; thick; white. MARGIN: strongly incurved, sometimes wavy or lobed. GILLS: clearly defined; close to each other; many of them forked; thick; tough; colour whitish or pale flesh. STEM: sometimes wanting, always lateral or very short; yellowish; solid; thick; base minutely brownish stippled.

This species is quite plentiful in the fall, growing on stumps of birch, beech, etc., from September to November. It might be mistaken for *Claudopus nidulans*, which is similar to it in shape and appearance, but differs by its orange-yellow gills and pink spores.

Pleurótus ulmárius (Bull.) Fr.

ELM PLEUROTUS

(Pl. 50)

EDIBLE

CAP: 2 to 6 inches broad; compact; firm to tough; convex, becoming expanded to plane; even; moist; smooth or somewhat downy; white or pale buff, becoming dull tan or brown in age; surface frequently faintly scaly and cracking when old. MARGIN: involute, often splitting with age; acute. FLESH: thick; tough; white. GILLS: sinuate to adnexed; rounded behind; broad; close to sub-distant; white or whitish. STEM: 1½ to 3 inches long, ½ to ¾ inch thick; solid, firm, elastic; variable; more or less central; straight or curved; thickened and tomentose at base; faintly yellow. Odour and taste pleasant.

Solitary or in clusters, usually on elm trees, also on hickory and maple trunks, from September to November. It is one of our best edible mushrooms, and generally free from maggots. It may be dried and used in winter.

PLEUROTUS SEROTINUS

PLEUROTUS ULMARIUS

Genus 12

Collýbia Fr.

The cap is fleshy, generally thin, often membranous; and with its margin at first incurved, convex, regular. The gills are soft; partly or wholly attached to the stem, sometimes sinuate, never decurrent; generally white, but frequently bright coloured. The stem lacks volva and ring, is cartilaginous, different in structure from the cap, but confluent with it. It is central and generally slender, either stuffed with a pithy substance or hollow. Some species are distinguished by their long, root-like, underground base. *Marasmius* is allied to this genus, but differs in its leathery cap reviving with moisture.

The species grow on the ground or wood, solitary or in clusters.

Collýbia albiflávida Pk.

STRIATED-STEM COLLYBIA

(Pl. 51[1])

EDIBLE

CAP: 2 to 5 inches broad; convex, expanded, then depressed, obtuse or slightly umbonate, umbo sometimes wanting; whitish or creamy yellow, umbo darker. MARGIN: at first involute; moist; even; smooth. FLESH: white. GILLS: sinuate and slightly attached to the stem; narrow, close, thin, edge entire; white or whitish. STEM: 3 to 6 inches long, ⅛ to ¼ inch thick; conspicuously striate; base bulbous, equal above; interior fibrous; cuticle cartilaginous; whitish.

Solitary or often in groups. It grows on the ground in moist, mixed woods, among fallen leaves, and is frequent from June to September.

Collýbia dryóphila (Bull.) Fr.

NUTBROWN COLLYBIA

(Pl. 52)

EDIBLE

This is a common and variable species. CAP: 1 to 2 inches across; at first hemispherical to cap-shaped, frequently nearly plane, with a prominent, depressed centre; smooth. The colour, especially at first, is nut-brown, then tan to brown-red or lighter. MARGIN: incurved in young plants and often irregular, expanding as the plant grows. FLESH: soft; thin; brownish-white. GILLS: free from the stem or adnexed; narrow; close to each other; white. STEM: 1 to 3 inches long, ⅛ to ¼ inch wide; hollow; thin; slender; cartilaginous; white, becoming yellow or reddish. The cap and stem of this species frequently show peculiar white lobes or warty growths on their surface, which is due to another fungus growing parasitically on this species, viz. *Tremella mycetophila*.

It is common, growing under all kinds of trees, from June to October.

Fig. 1. COLLYBIA ALBIFLAVIDA

Fig. 2. COLLYBIA LONGIPES

COLLYBIA DRYOPHILA

Collýbia lóngipes (Bull.) Berk.
LONG-FOOTED COLLYBIA
(Pl. 51[2])
EDIBLE

CAP: 1½ to 4 inches broad; convex, becoming expanded, sub-umbonate; always dry; tough; thin; radiately wrinkled, particularly around disk; surface densely covered with short, velvety, nut-brown hairs, disk darker. MARGIN: thin; even; involute. FLESH: thin; white. GILLS: adnexed, moderately distant; minutely serrate; slightly ventricose; broad; thin; white. STEM: 3 to 5 inches long, frequently longer, ⅛ to ¼ inch thick; solid; firm; straight to twisted, tapering to apex; covered with minute brown scales, producing a finely stippled appearance; pure white at apex; the base like a slender tap-root, frequently over a foot long.

On decayed wood, generally about stumps, in open woods; frequent locally from August to October.

This specimen shows a root-like stem similar to *C. radicata*, from which it is readily distinguished by being on the whole a much smaller species, by its persistently dry and velvety cap, and the stippled appearance of its stem.

Collýbia platyphýlla (Pers.) Fr.
BROAD-GILLED COLLYBIA
(Pl. 53[1])
EDIBLE

This species is one of the largest of the genus, the CAP reaching from 3 to 8 inches in width. The surface is convex at first, but soon becomes plane; watery when moist; covered with fine, hair-like, darker fibres arranged in radiating lines. The colour is dark to greyish-brown in the centre, but lighter at the margin. MARGIN: conspicuously upturned when old; wavy. FLESH: thin; quite brittle; white to cream. GILLS: unusually broad, widest at the centre, often approaching an inch in breadth, rounded behind; very distant; slightly attached to the stem; white, later changing to cream. When old they frequently crack or break transversely. STEM: 3 to 4 inches long, ½ inch thick; cartilaginous; the interior filled with a pithy substance, changing to hollow. Externally smooth to striate. The base ends abruptly, forming a rounded bulb.

This plant is readily determined by its broad gills, whence it takes its name. It grows singly, rarely in clusters, on decaying wood or at the edge of thin woods, from June to October.

Collýbia radicáta (Rehl.) Berk.
ROOTED COLLYBIA
(Pl. 54)
EDIBLE

CAP: 2 to 6 inches wide; convex at first, soon becoming plane, with a broad, somewhat raised centre; fleshy; rather thin; smooth, slimy when moist; with radiating wrinkles. The colour is variable; some are nearly white, others greyish, greyish-brown to dark-brown. MARGIN:

Fig. 1. COLLYBIA PLATYPHYLLA

Fig. 2. COLLYBIA VELUTIPES

COLLYBIA RADICATA

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upturned in old specimens. FLESH: thin; white. GILLS: attached to the stem by their inner margin; tough; broad; distant. Later they are much broader in the middle, rounded or notched at the stem end. Frequently an occasional one runs down the stem. The colour is a pure white. STEM: solid or filled with a pithy substance from 4 to 9 inches long, ¼ to ⅜ inch thick; smooth; firm; tapering gradually to the cap. Its skin peels readily. Colour like the cap or a little paler, the lower part mottled with grey. It is often striate or grooved, and sometimes mealy. The stem extends for a long distance into the ground, in form like a "tap-root."

It grows in woods or on the borders of woods, on the ground in decayed wood or about stumps, singly or in groups, from June to October. Care should be taken that this species is not confused with *C. longipes*.

Collýbia velûtipes (Curt.) Fr.

VELVET-STEM COLLYBIA

(Pl. 53[2])

EDIBLE

CAP: 1 to 2 inches broad; at first convex, soon becoming plane, sometimes slightly depressed in the centre, often irregular; fleshy; in colour yellowish or reddish-brown at the disk, tawny towards margin. MARGIN: thin; generally turned in, often wavy. The surface is smooth; shining; viscid. FLESH: soft; thick at the centre, thin at margin; whitish or yellowish; with a decidedly sweet, pleasant taste. GILLS: slightly joined to the stem; somewhat distant; broadest at the centre, rounded behind, very unequal in length; tawny or honey-yellow. STEM: 1 to 3 inches long, ⅛ to ⅜ inch thick; frequently curved; hollow, sometimes stuffed with a pithy substance; slender; tough; cartilaginous; densely covered with short, coarse, erect, brownish, velvety hairs, dark-umber to black at the base but lighter at the top.

This plant is found in dense clusters, on stumps and decaying wood, frequently growing from decayed spots in living trees. Throughout the summer but is at its best during late fall. It seems to be uninjured by cold weather, and is frequently found in a flourishing condition after passing through hard frost.

Its habitat, the dark, velvety stem, and sticky cap are characters whereby this species may be readily recognized.

Genus 13

Omphália (Pers.) Fr.

The plants comprising this genus are all very small, scarcely over an inch high, having thin, delicate caps, at first slightly depressed, then becoming funnel-shaped, with either incurved or straight margin. The gills are decurrent. The central stem is generally quite slender and of a cartilaginous character, continuous with cap and of different texture. They are found throughout the summer growing in large numbers in damp places on dead or rotten logs and stumps.

Fig. 1. OMPHALIA CAMPANELLA
Fig. 2. (All others) MYCENA GALERICULATA

Omphália campanélla (Batsch.) Fr.

LITTLE BELL OMPHALIA

(Pl. 55[1])

EDIBLE

CAP: ½ to ¾ inch broad; convex campanulate, becoming expanded, centrally depressed; thin; prominently striate; watery when moist; dull orange-yellow or reddish tinged. FLESH: very thin; membranous; yellow. GILLS: moderately close; adnato-decurrent; venose; thick; narrow; rigid; yellowish. STEM: ½ to 1½ inch long, ⅛ inch or less thick; hollow; curved or straight; firm; horny; rigid; even; brown, paler at apex; base covered with tawny short, stiff hairs.

This is a common and easily recognized plant, growing in dense clusters on much decayed pine and coniferous logs and stumps, from June to November.

Genus 14

Mycéna Fr.

This graceful, rather perishable genus has a fleshy, almost membranous, regular cap, cone to bell-shaped. Quickly succumbing in dry weather and not reviving as *Marasmius*. The margin is straight, never incurved. Stem central, cartilaginous, tubular. The gills are adnate to sinuate, with a decurrent tooth. Growing on ground or wood, singly or assembled.

Mycéna galericuláta (Scop.) Fr.

SHINY-STEM MYCENA

(Pl. 55[2])

EDIBLE

CAP: 1 to 2 inches broad; bell to cone-shaped, umbonate; dry; fragile; smooth; pale greyish to greyish-brown, centre deeper in colour. MARGIN: striate; thin; sometimes wavy. FLESH: soft; very thin; whitish. GILLS: adnate or decurrent with a tooth; rather broad; distant; unequal; connected by veins; edges entire or finely notched; white when young, then flesh colour, often stained when old. STEM: often with twisted underground portions; 1½ to 4 inches long, ⅛ to ¼ inch thick; shining; tough; cartilaginous; often twisted; even; smooth, or finely striate; with dingy yellow, haired base; colour white at apex, yellowish to brownish at the base.

An extremely variable species, growing in thick clusters on decayed wood, stumps, logs, etc., from early spring to late fall; very common.

Fig. 1. MYCENA LEAIANA
Fig. 2. MYCENA HAEMATOPUS

Mycéna haemátopus (Pers.) Fr.

BLOOD-STEM MYCENA

(Pl. 56[2])

EDIBLE

CAP: ½ to 1 inch broad; gracefully cone to bell-shaped; smooth; more or less umbonate; colour variable, whitish to flesh or dull red, fading towards centre, easily stained dark. MARGIN: extending beyond gills; even or slightly striate; thin; scalloped. FLESH: thin, membranous; pinkish, turning blood-red when bruised. GILLS: adnate, with a tooth, narrow, subdistant; whitish, easily reddish-stained. STEM: 2 to 4 inches long, about ⅛ inch thick; colour reddish-tinged; hollow; fragile; firm; even; smooth except at the base, which is downy, with soft hairs; exuding blood-red juice when cut. Odour and taste mild.

Growing in dense clusters on stumps and decayed wood, common from July to September. It is easily recognized by its grouping habit, hollow stem, blood-red juice, and the notched margin of the cap.

Mycéna Leaiána Berk.

LEA'S MYCENA

(Pl. 56[1])

EDIBLE

CAP: ¾ to 1¼ inches broad; convex, becoming partly expanded, umbilicate; very viscid; shining when moist; quite smooth; cuticle separable; colour bright-orange. MARGIN: striate. FLESH: thicker than usual in this genus; whitish to yellowish. GILLS: adnate, notched at the stem; distant; narrow; thick; yellowish to pale-orange, with reddish edge. STEM: 2 to 3 inches long, ⅛ inch thick; viscid; smooth; hollow; equal or slightly tapering to the cap; cartilaginous; ground colour yellowish, dusted orange. The base varies; it is hairy or with a coloured down.

This beautiful species grows in dense clusters on decayed logs and stumps, and is easily recognized on account of the viscid stem and cap, and by its striking orange-red colour throughout. It grows from July to September, and is infrequent locally.

Genus 15 **Marásmius** Fr.

This genus contains a very large number of species, but with few exceptions the plants are small and of little importance. The cap is tough and leathery, thin and membranous, shrivelling in dry weather but reviving with moisture. The pliant gills are attached to the stem, when they may be adnate and even decurrent, or they may be altogether free. The stem is central, cartilaginous, very tough, in some species horny, confluent with the pileus but of different texture. The species occur in grass or on wood or leaves, singly or associated.

This genus is closely related to *Collybia*, and in many cases it is difficult to distinguish between them.

MARASMIUS OREADES

Marásmius oréades (Bolt.) Fr.

FAIRY RING FUNGUS

(Pl. 57)

EDIBLE

CAP: 1 to 2 inches across; convex, becoming plane, with a prominent elevation in the centre; rather thin; dry and spongy to touch; smooth; slightly striate when moist. The colour varies from pale-tan to buff, sometimes golden-brown, and darkest at the centre. MARGIN: thin; often wavy, and in old specimens upturned. FLESH: somewhat tough; thick at the centre of the cap; colour cream. It has a very pleasant odour and nutty taste. GILLS: free from the stem; broad; tough; distant; and rounded towards the stem end. In colour they are faintly tawny, and when dry, cream. STEM: 2 to 3 inches long, ⅛ inch thick; solid; very tough; equal; cartilaginous; surface covered with a fine down, easily rubbed off.

This is a common species, growing in grass and pastures in the form of a more or less complete ring, hence its name. It is a great favourite and most palatable. This is one of the fungi often found in such abundance that it is worth drying what cannot be consumed at the time.

A word of explanation as to the cause of the circular growth of this and other fungi might here be in order.

Originally the fungus commenced its growth at the centre of any given ring. Gradually the mycelium exhausts the soil, and growth, which is perennial, proceeds outward around the edges. Eventually a small circle is formed. This process is continued from year to year, the ring becoming larger and larger and gradually creeping forward all around the edge. The mycelium for a time kills the grass, but this will soon fill in again from its underground roots.

Genus 16

Lentínus Fr.

The plants of this genus have thin, pliant, fleshy-leathery or corky caps, generally depressed in the centre or funnel-shaped, tough, dry, often sessile, irregular from crowding, often scaly or velvety. The flesh is tough, shrivelling when dry, reviving with moisture, and woody when old. The gills are adnate or decurrent, tough, thin, notched, unequal, and with serrate or toothed edges. The stem, when present, is central, excentric or lateral, confluent with the cap and of the same substance, hard, firm, and many grow from the same base.

This is a common genus, and is found solitary or in clumps on decayed or rotting wood, rarely on the ground.

Lentínus cochleátus (Pers.) Fr.

COCKLE-SHELL LENTINUS

(Pl. 58)

EDIBLE

CAPS: 1½ to 3 inches broad; thin; fleshy to tough; very irregular; overlapping like shingles; depressed or funnel-shaped; surface covered with erect, short scales; pliant; roughly and deeply furrowed; the furrows pale to flesh or honey-colour, the ridges spotted reddish-

LENTINUS COCHLEATUS

brown. MARGIN: thin; wavy, often lobed, striate, acute, involute. FLESH: firm; thin; compact; greyish. It has a spicy odour and taste, like anise. GILLS: extend down the stem, crowded; edges serrate; thin; tough; whitish to flesh colour. STEM: 1 to 1½ inches long, ¼ to ½ inch at middle; solid; firm; tough, leathery, pliant; grooved, tapering to base, many fusing for part of their length, central, often excentric and flattened; flesh-coloured at apex, base dark reddish-brown.

This species is found in dense clusters, principally on birch or ash stumps, in shady, moist woods, from August to October. Hardly to be recommended for the table.

Lentínus lepídeus Fr.

SCALY LENTINUS

(Pl. 59)

EDIBLE

CAP: 2 to 6 inches broad; regular or irregular, convex or nearly plane, sometimes slightly depressed in centre; compact and firm, hard when dry; variegated with very prominent, concentric brownish, often blackish, smooth scales, even or often cracked into small areas; colour buff to pale ochre. FLESH: thick; pliant when fresh, hard when dry; white; with agreeable odour. GILLS: decurrent; fairly distant; broad; crowded towards margin; showing transverse lines; toothed to serrate edges; white to yellowish, frequently rusty stained. STEM: 1 to 2 inches long, ⅜ to 1 inch thick; solid, hard; frequently tapering towards the base; more or less covered with rings of recurved, coloured scales, otherwise whitish.

Solitary or caespitose, almost rooting; common from May to October, on old timber, particularly railroad ties, apparently preferring wood of the conifers. It is easily dried and grated, and may be used as a pleasant flavouring in gravies, etc.

Lentínus vulpínus (Sow.) Fr.

LOBED LENTINUS

(Pl. 60)

NOT EDIBLE

CAP: 2 to 6 inches broad; convex; sessile, over-lapping like shingles; joined laterally; lobe to fan-shaped; surface coarsely hairy and longitudinally ridged towards margin, changing into fine teeth, declining towards base into white warts; colour flesh to that of light leather. MARGIN: strongly incurved. FLESH: thin; whitish toward the gills, and darker toward the surface. Odour and taste intensely pungent. GILLS: decurrent; broad; coarsely serrate; cracking in age and in drying; crowded; narrowed toward the base of the cap; white or tinged flesh colour.

It grows on decayed logs, stumps, and trunks of trees, from July to October.

LENTINUS LEPIDEUS

Genus 17

Pánus Fr.

The plants of this genus are leathery, tough, irregular in shape, growing generally in clusters, becoming hard and dry when old. The cap may be attached laterally, and stem lacking or excentric; if present, continuous with cap, and of same texture. Gills entire, decurrent. The genus *Lentinus* is closely related to *Panus*, but differs in having gills with serrate margins.

Pánus stípticus (Bull.) Fr.

BITTER PANUS

(Pl. 61)

NOT EDIBLE

CAP: ½ to 1 inch broad; convex, shell-shaped to reniform, resupinate; very tough; overlapping; sometimes zoned; with a semi-circular depression towards the stem; surface covered with dense, minute, bran-like particles or scales; colour pale-cinnamon. FLESH: firm; coriaceous; thin; white. Taste slowly or soon strongly acrid or bitter. GILLS: same colour as cap; crowded; adnate, terminating at a uniform point at the stem. STEM: 1 inch or less long, ¼ to ⅜ inch broad; solid; lateral; short; abruptly curved; tapering to the base; compressed; tough; densely hairy; leathery.

Caespitose, on stumps, logs, etc., common from May to October.

This small species is too tough to be edible, besides, its taste is very disagreeable. When fresh, certain strains show luminescence in the dark. It revives after drying, when moistened.

SUBDIVISION B

Pink-spored Genera

Genus 18

Volvária Fr.

This genus, as its name would indicate, possesses a volva. All species are at first wholly enclosed within a membranous cover. The stem on expanding ruptures this irregularly, and the remains of this cover form a typical volva, as described in greater detail under the white-spored genus *Amanitopsis*. Occasionally part of the cover will adhere to the surface of the cap. The cap is fleshy, regular, and bell-shaped. The stem is central and prominently distinct and easily separable from the cap. It never bears a ring. The gills are free from the stem, rounded behind to broad in the middle, at first white, later becoming pinkish through the presence of mature spores. Growing on wood or on ground.

LENTINUS VULPINUS

Volvária bombýcina (Schaeff.) Fr.

SILKY VOLVARIA

(Pl. 62[1])

EDIBLE

CAP: 4 to 8 inches broad; at first globose, bell-shaped, partly expanding, broadly umbonate; dry; shining; entire surface covered with silky hairs, becoming scaly when old; pure white. MARGIN: obtuse; thin; extending beyond the gills. FLESH: soft; very thin; white. GILLS: free; rounded behind; close; ventricose; minutely toothed; broad; at first white, turning flesh colour from the pink spores. STEM: 3 to 6 inches long, ¼ to ½ inch thick; solid; even; smooth; tapering to the cap, usually curved; white. VOLVA: large; membranous; margin torn and standing away from stem as a large, loose cup; colour white, becoming darker with age.

Solitary or growing together, on stumps or on living trees, usually from wounds; from July to September.

Volvária speciósa Fr.

SHOWY VOLVARIA

(Pl. 62[2])

EDIBLE

CAP: egg-shaped at first, later 2 to 4 inches broad; conical, becoming expanded, prominently elevated centre; very viscid; smooth; white or whitish, greyish in the centre. FLESH: very sóft; thin; white. GILLS: free; close; broader in the middle, edges finely toothed; flesh-coloured to reddish. STEM: 4 to 8 inches long, ½ to ¾ inch thick; solid; equal or tapering to apex, cylindrical; at first covered with soft, short hairs, becoming smooth; base tomentose, bulbous, white. Volva: large; edge free, remainder fitting closely; flabby; irregularly torn; white. Odour strong, taste mild.

Solitary and gregarious, growing on fertile soil or leaf mould in woods, often in open fields. Not common.

This species, like many other fungi, is stigmatized by many authors as poisonous. In a good many cases the poisonous property is well-founded, but in most other cases this stigma is quite erroneously attached to fungi. Partly mere suspicion, partly due to offensive odours or resemblance to well-known poisonous forms, the fact remains that few authors are willing to accept the grave responsibility of departing from what has thus become generally and often incorrectly accepted. To them a fungus once reported as poisonous remains so. Surely when many people have pluckily eaten of previously suspected fungi, and on frequent occasions under the supervision of mycological experts, it is folly to perpetuate a characteristic so often untrue. In this instance as in the former species *bombycina*, we have as our authority men who have eaten both species and consider them not only edible, but among the best. Wherever we have stated in the pages of this bulletin that a certain fungus is edible, we have done so fully aware of our responsibilities in this regard.

PANUS STIPTICUS

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Genus 19

Plúteus Fr.

This genus, with the exception of *Pluteus cervinus*, is composed of small species; the volva and ring are lacking in all. The gills are unusually soft, free from the stem and rounded towards it, at first white, soon changing to a rose or salmon tint. The central stem readily separates from the cap. The plants are found growing on decayed wood or on sawdust, rarely on the ground.

Plúteus cervínus (Schaeff.) Fr.

FAWN-COLOURED PLUTEUS

(Pl. 63)

EDIBLE

CAP: 2 to 4 inches across; at first bell-shaped, then broadly convex, becoming expanded, often slightly raised in the centre; viscid when moist; surface variable; smooth or covered with dark fibrils, often more or less scaly; cuticle easily separating from cap. Colour white, dingy-tan, greyish-brown, sometimes sooty. MARGIN: thin; even. FLESH: soft; rather moist; very brittle; white. GILLS: free; close; broad; rounded at stem end, broader at margin; at first white, turning flesh colour when mature. STEM: 2 to 6 inches long, ¼ to ¾ inch thick; solid; firm; equal or slightly tapering upwards; smooth or scaly, often covered with fibrils; colour white, stencilled with brown fibres, darker at base.

It grows solitary, scattered, or frequently in clusters, on stumps and prostrate trunks. A favourite habitat is afforded by decaying sawdust. It is one of our best edible species, and occurs from June to November.

A peculiarity of this genus is the softness of the gills, which soon become moist and mushy.

Genus 20

Entolóma Fr.

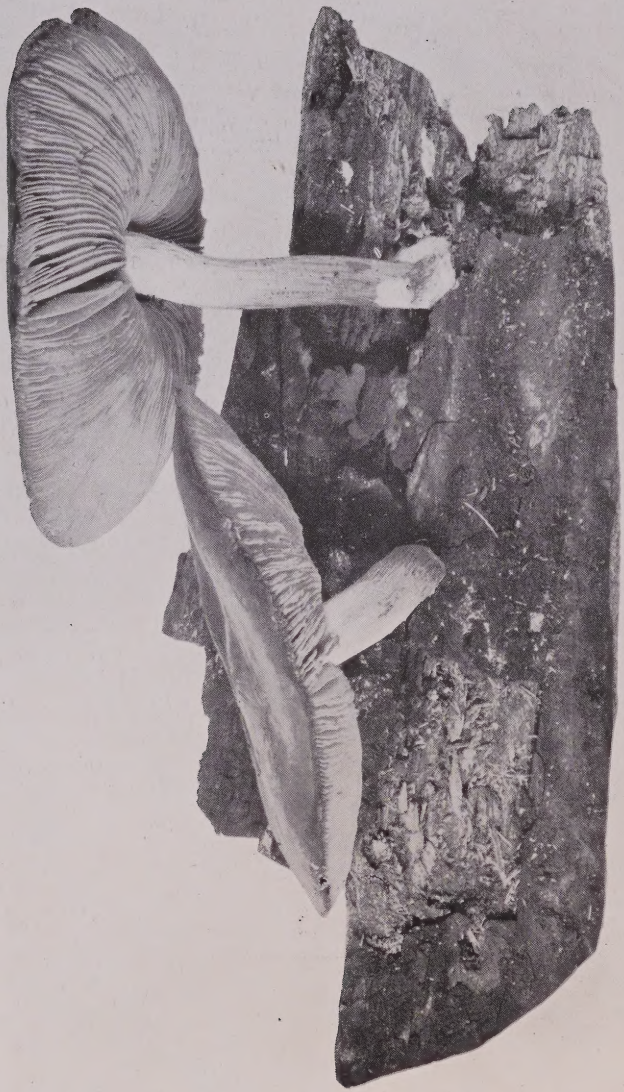
This genus lacks volva and ring. The cap is somewhat fleshy, and the margin incurved, particularly when young. The stem is central, not separable from the cap; and the gills are adnexed or sinuate, sometimes separating from the stem.

Pluteus and *Clitopilus* are similar fungi, but can easily be distinguished from *Entoloma*. The former has gills free, with cap and stem separating readily; *Clitopilus* has decurrent gills, never sinuate, and as in this genus, the stem does not separate readily.

Entoloma is similar to *Tricholoma* of the white-spored series, *Hebeloma* of the ochre-spored, and *Hypholoma* of the purple-spored series. The genus consists mostly of large, soft mushrooms, growing on the ground copiously after rain; soon perishing.

Fig. 1. VOLVARIA BOMBYCINA
Fig. 2. (All others) VOLVARIA SPECIOSA

23837—9½



PLUTEUS CERVINUS

Entolóma grânde Pk.

GIANT ENTOLOMA

(Pl. 64)

DOUBTFUL

A fine, sturdy plant, characterized by its large size and general robust appearance. It is perhaps the largest of the genus.

CAP: 6 to 8 inches across, often larger; at first convex, most irregular, broadly umbonate, decidedly wrinkled; silvery lustre, smoky-grey to pallid-yellow or drab. The surface is not watery, though superficially moist. MARGIN: thick; wavy, involute; edge acute. FLESH: thick; firm but brittle; white. GILLS: adnexed, becoming almost free; abruptly rounded behind, very broad, thin; distant; edge undulating; sordid-white to flesh; frequently powdery from the spores. STEM: 3 to 4 inches long, ¾ to 1½ inches thick; central; solid; very tough; equal; mealy at apex; slightly striate; colour chalky-white. Taste often stated to be burning, but we found it mild and pleasant. Suspected.

Singly or in immense clusters, below coniferous trees on ground, from August to October.

Entolóma Grayánum Pk.

GRAY'S ENTOLOMA

EDIBILITY NOT DETERMINED

CAP: 2 to 4 inches broad; bell-shaped, obtuse, becoming expanded, broadly umbonate; firm; surface quite smooth, though occasionally wrinkled at disk; rather watery and glassy; at first whitish to drab, but when dry shining and whitish. FLESH: thin; whitish to yellowish. GILLS: adnexed; close; slightly emarginate; rounded behind, broader in middle; thick; edges eroded; colour drab at first, changing to deep-flesh. STEM: 2 to 5 inches long, ⅜ to ¾ inch thick; stuffed, but base solid; striate; equal, tapering to the cap; firm; smooth; straight or curved, often twisted; silky; shining; watery; white or faintly tinged yellow.

Solitary or a few growing together on ground in woods, from August to October. Distinguished by its watery appearance, its white to drab cap, and its light-salmon-tinted spores. It resembles *E. grande*, which is a much larger and stronger plant, with a more fleshy cap, which is generally quite dry.

Entolóma rhodopólium Fr.

ROSY ENTOLOMA

(Pl. 65)

DOUBTFUL

CAP: 2 to 5 inches broad; slightly bell-shaped, becoming expanded and plane, slightly umbonate, sometimes depressed; watery; fibrillose when young, smooth when fully grown; cuticle slightly sticky to the touch; colour dingy-brown when young, changing to smoky-grey

ENTOLOMA GRANDE
(One-half natural size)

ENTOLOMA RHODOPOLIUM

and silky shining when dry. MARGIN: at first incurved, then undulate. FLESH: watery; becoming white, darker below cuticle. GILLS: adnate, somewhat sinuate; broad; slightly distant; edge minutely eroded; whitish, changing to deep flesh colour. STEM: 2 to 4 inches long, ¼ to ½ inch thick; cartilaginous; hollow; nearly equal, tapering either up or down; apex white and mealy, remainder glabrous; slightly striate; cuticle thick; fibrous; colour white. Odour slight; taste mild.

Solitary or caespitose on ground, in mixed woods, from August to October; frequent.

This species is large and fragile, with pure white stem and deep flesh-coloured spores.

Genus 21

Clitopílus Fr.

The plants in this genus have caps more or less irregular, wavy on the margin, and usually depressed or umbilicate. The gills are decurrent or broadly adnate; variably coloured, at first white. The stem is central, fleshy and fibrous, of the same substance as the cap and continuous with it. It lacks ring and volva.

Clitocybe is somewhat similar, but has white spores and gills. *Clitopilus* includes some of our best edible species, and none in this genus are poisonous. Growing on ground, and on decayed wood, in open woods.

Clitopílus abortívus B. et C.

ABORTIVE CLITOPILUS

(Pl. 66)

EDIBLE

CAP: 2 to 4 inches across; hemispherical to convex, becoming expanded, slightly depressed in the centre, often nearly plane; fleshy; dry; very fragile; surface soft, silky, hairy; colour light-grey, turning brownish when old. MARGIN: thin; wavy to lobed; incurved when young; acute. FLESH: thin; fragile; soft; white; taste mealy. GILLS: decurrent; close to each other; thin; minutely serrate; often broader at the middle; colour sordid-white at first, then pinkish-grey, finally light-salmon. STEM: 2 to 3 inches long, ¼ to ½ inch thick; solid; tough; fleshy; equal; fibrous; striate; covered with a bloom at apex; colour greyish like cap, becoming lighter.

This plant is frequently found imperfectly developed, i.e., it lacks cap and gills, hence its technical name "abortive." A normal plant often arises from a curious, shapeless clump resembling malformed puffballs. The cause of this condition is not accurately known, it may be due to an attack by a parasitic fungus; but nevertheless the malformed specimens are equally good in flavour. The fungus is found growing solitary and in groups, in open, shaded woods, or where stumps have decayed; from September to October.

CLITOPILUS ABORTIVUS

Clitopílus popinális Fr.

SPOTTED CLITOPILUS

(Pl. 67)

BITTER

CAP: 1½ to 2½ inches across; convex at first, soon expanding, becoming depressed in the centre; dry; shining; surface obscurely zoned by darker shades, mottled, spotty; colour dingy-white, soon becoming ashy-brown or grey to smoky. MARGIN: thin; smooth; wavy, incurved at first, becoming upturned and acute. FLESH: firm; thin; very bitter; greyish-white. GILLS: deeply decurrent; close to each other; thin; narrow; unequal; white, becoming greyish, with a tint of flesh colour. STEM: 1 to 2 inches long, ¼ to ½ inch thick; solid to stuffed; slender; flexible; equal or slightly tapering to base; covered with thick, white, silky fibres; base swollen; paler than cap.

This species grows in groups, often in clusters, in shady groves, among leaves. It is not common, and is frequently found growing in long rows and in incomplete rings, from August to October. Some authors consider this to be *C. noveboracensis* of Peck.

Genus 22

Claûdopus W. G. Sm.

This small genus contains practically no edible species. They usually grow on wood, and are rather tough and dry. The cap is lateral or excentric. Stem lateral or wanting. The gills radiate from a definite point, or are decurrent when stem is present. The genera *Pleurotus* and *Crepidotus* are somewhat similar in general appearance. The former has white, the latter brown, whereas *Claudopus* has pink spores.

Claûdopus nídulans (Pers.) Pk.

EGG-YELLOW CLAUDOPUS

(Pl. 68)

TOUGH

CAP: 1 to 3 inches broad; attached to wood at the margin; overlapping; semicircular to round to shell-shaped; narrowed towards point of attachment; surface covered with short, stiff tufts or hairs; colour egg-yellow. MARGIN: involute at first; decidedly hairy. FLESH: thin; tough and spongy; yellow. GILLS: adnate; broad; moderately close; radiating from point of attachment; orange-yellow. STEM: wanting. Odour strong; taste mild.

Gregarious and imbricated, growing on decaying logs, in damp situations, from July to October.

It is a conspicuous fungus, and easily recognized by its bright yellow colour and hairy cap. It is widely distributed, and edible, but tough and of poor flavour.

CLITOPILUS POPINALIS

SUBDIVISION C

Brown-spored Genera

Genus 23

Pholióta Fr.

The spore colour of this genus varies in tints of brown, from sepia, ochre-yellow, to rusty-brown. It differs from all others of the brown-spored series in having a typical ring. The gills are attached to the stem, often with a decurrent tooth. The stem is central, either solid or spongy within, of the same substance as the cap and continuous with it. Generally growing on wood, above or below the ground level, with a few exceptions.

Armillaria of the white- and *Stropharia* of the purple-spored series, are similar in general appearance.

Pholióta adipósa Fr.

STICKY PHOLIOTA

(Pl. 69)

EDIBLE

CAP: 2 to 4 inches broad; hemispherical, becoming expanded, broadly umbonate; sticky when moist, shining when dry; surface covered with erect, pointed, reddish-brown scales; colour saffron-yellow underlying the prominent scales. MARGIN: thin; appendiculate; acute; much inrolled at first. FLESH: firm; leathery when old; thick at centre, thin at margin; yellowish-white. GILLS: attached to the stem; close to each other; broad; thin; sometimes notched; tough; yellow, becoming rusty colour like the spores. STEM: 2 to 3 inches long, ⅓ to ½ inch thick; solid or sometimes spongy within; equal; firm; usually curved; covered with fine scales below the ring; colour yellowish, base darker; dusty with spores. RING: of the same colour as the stem; dry and pendulous; torn at margin.

This species generally grows in large clusters on stumps or on trunks of dying, deciduous trees; from September to frost.

Pholióta praécox (Pers.) Fr.

EARLY PHOLIOTA

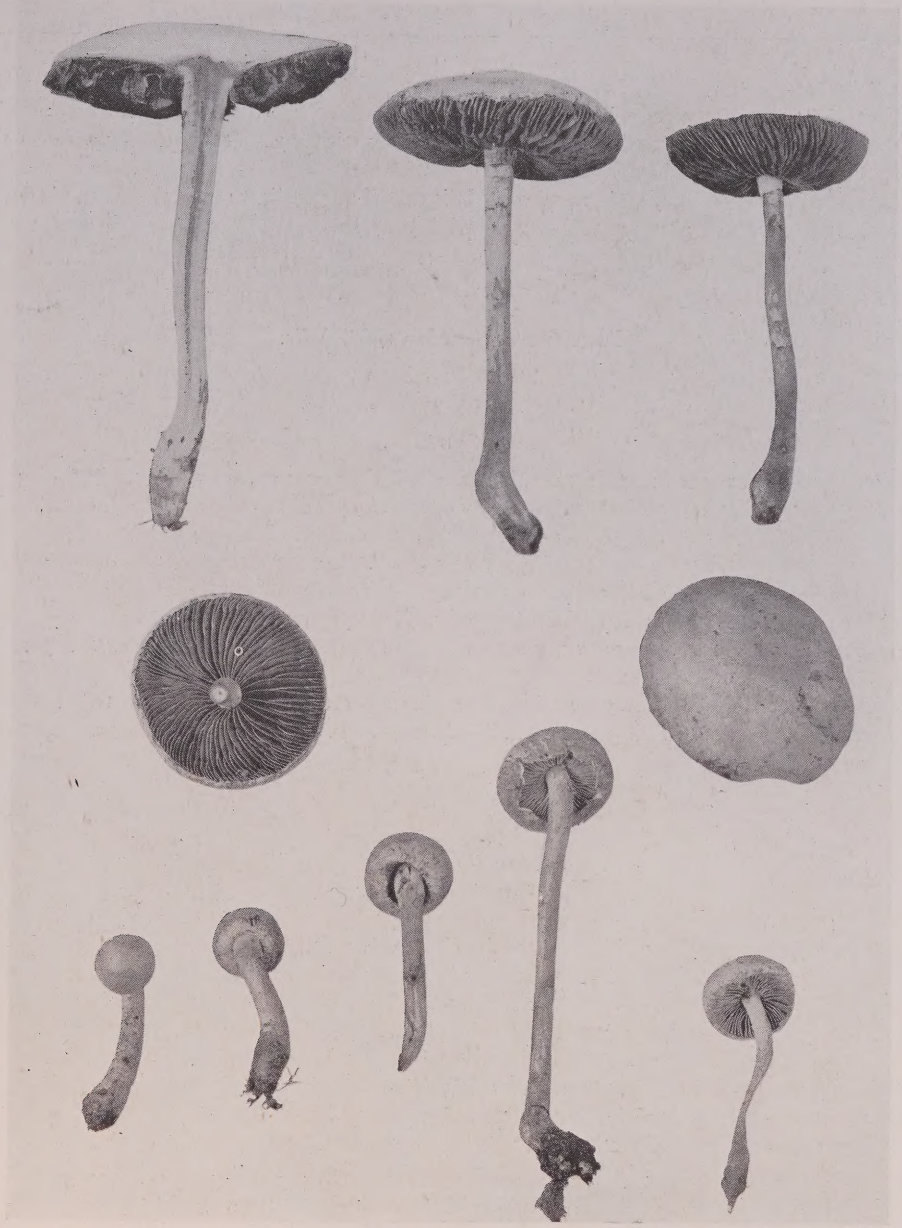
(Pl. 70)

EDIBLE

CAP: 1 to 2 inches broad; convex or nearly plane; fleshy; soft; smooth; even; slightly viscid when moist; whitish or yellowish, often pale tan. MARGIN: incurved. FLESH: white; thick at centre. GILLS: adnate; crowded; often notched at the stem-end, widest at the centre, rounded behind, broad, unequal; at first dirty-white to grey, becoming rust-coloured. STEM:

CLAUDOPUS NIDULANS

PHOLIOTA ADIPOSA



PHOLIOTA PRAECOX

1½ to 3 inches long, ⅛ to ¼ inch thick; spongy within, sometimes becoming hollow; equal, usually straight; apex covered with a frost-like bloom; smooth; colour whitish. RING: delicate; sometimes found at the apex of the stem; disappearing with age. It frequently adheres to the margin of the cap in ragged patches.

This plant grows solitary or in numbers. It is one of our earliest mushrooms, and is common in lawns, meadows, and along roadsides, from May to June.

Pholióta squarrósa (Müll.) Fr.

SCALY PHOLIOTA

(Pl. 71)

EDIBLE

CAP: 2 to 4 inches broad; at first nearly spherical, then convex, expanding when old; firm; never sticky, though often moist; surface covered with concentrically arranged, erect, pointed, persistent scales, denser at the disk; colour yellowish to rusty. MARGIN: much incurved when young, often wavy. FLESH: soft; thick; pale yellow. GILLS: attached to the stem; nearly decurrent; frequently notched behind; crowded; rather narrow; at first pale olive, becoming brownish-rust colour. Stem: 2 to 4 inches long, ¼ to ½ inch thick; spongy within; equal; firm; covered with thick, fleecy, tawny scales below the ring, white above. RING: persistent; fleecy; same colour as the stem.

This rather striking plant grows in dense clusters on trunks of various trees, also from decayed knotholes, etc., of living trees. It is a late grower, found in September and October.

Genus 24

Cortinárius Fr.

This genus has powdery gills and a cobwebby veil which extends from the margin of the cap to the stem. This veil must be looked for in young plants, for it disappears with age. The cap is frequently brilliantly coloured, and may be silky, viscid, dry, or appearing as if water-soaked. The gills are variably attached to the stem, frequently notched, adnate, or decurrent, and dusted with the rusty-brown spores. The stem, which is central, is continuous with the cap, and does not separate from it. The texture is often spongy in the large forms, while in the smaller the external layer is rigid, frequently bulbous, and never slimy.

This is a large genus, difficult to determine unless collected when the characteristic veil is present, containing some edible forms. None are known to be poisonous, but a large number are poorly flavoured, woody or bitter, which property persists even after cooking. They grow on moist ground, at first covered with masses of fallen leaves, principally during late summer and fall.

PHOLIOTA SQUARROSA

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Cortinárius albovioláceus (Pers.) Fr.

SILVER-VIOLET CORTINARIUS

(Pl. 72)

EDIBLE

CAP: 2 to 4 inches broad; convex, only partially expanding, broadly umbonate; fleshy; dry; surface covered with fine, silky, brown fibrils; even; smooth; colour whitish-violet tinted at first, varying from pale bluish-grey to tawny with a lavender tint. MARGIN: thin; smooth; much incurved. FLESH: soft; very thin at margin, thick at disk; whitish with a violet tint. GILLS: adnate; often notched at stem, sometimes with a decurrent tooth; fairly distant; broad; thin; margin finely eroded; colour violet, changing to purplish, at length to cinnamon-brown; powdery from the spores. STEM: 2 to 3 inches long, ¼ to ½ inch thick; solid; tapering to cap; fibrous; silky; enlarging into a thick, bulbous base. VEIL: present in the form of silky cinnamon-coloured threads at apex, often indistinct.

These plants are found in groups in shady, moist woods, during September and October.

Cortinárius armillátus Fr.

RED-ZONED CORTINARIUS

(Pl. 73[2])

EDIBLE

CAP: 3 to 5 inches wide; convex or bell-shaped, becoming plane; viscid when fresh and in damp weather; fleshy; smooth; covered with fine, soft strands, which soon disappear; colour dark brownish-red, lighter at margin. MARGIN: thin; incurved. FLESH: firm, often spongy; thick; pallid with a mauve tint when old. GILLS: attached to the stem, or notched, often with a decurrent tooth; broad; distant; unequal in length; thin; colour pale cinnamon, turning rusty to dark brown. STEM: 3 to 6 inches long, ½ to ¾ inch thick; solid; even; covered with a fibrous pellicle or skin; terminating in an abrupt or club-shaped bulb. Remnants of the veil at apex. One or more red bands circle the stem below the veil, and are at times quite distinct. Above the veil the colour is lighter, below it is brownish-reddish.

This is a large species, but not common. It may be identified by its large size, tawny-reddish cap, and zoned stem. It occurs from August to October, among remains of rotten wood and under coniferous trees.

Our photograph of this species shows most beautifully the characteristic cobwebby veil extending from the stem to the margin of the cap.

Cortinárius cinnamómeus (L.) Fr.

CINNAMON CORTINARIUS

(Pl. 73[1])

EDIBLE

CAP: 1 to 2 inches wide; hemispherical, becoming expanded, more or less raised in the centre; dry; fragile; fleshy; shining; surface densely covered with minute, close, silky fibrils;

CORTINARIUS ALBOVIOLACEUS

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bright-brown to yellowish-cinnamon, very variable. MARGIN: thin; smooth; acute; involute. FLESH: soft; thick at centre, thin at margin; yellowish. GILLS: attached to the stem; rounded behind, sometimes slightly notched; crowded; edges uneven; thin; broad; spore-powdered; shiny; colour at first citron-yellow, changing to bright reddish-cinnamon. STEM: 2 to 3 inches long, ⅛ to ¼ inch thick; hollow, the small core filled with webby filaments; equal; covered with quite long, hairy, brownish fibrils, showing yellow underneath.

This species is not common, but when found usually many are growing together. Its shape and colours are extremely variable. It occurs in mossy places under coniferous trees, from August to October.

Cortinárius lilacínus Pk.

LILAC-COLOURED CORTINARIUS

(Pl. 74[1])

EDIBLE

CAP: 2 to 3½ inches broad; hemispherical, becoming convex; smooth; silky; lilac. MARGIN: at first involute. FLESH: solid; firm; thick at centre, thin at margin; tinged lilac. GILLS: adnexed; round towards stem; close; broad; thick; at first lilac, changing to cinnamon. STEM: stout; 2 to 5 inches long, ½ to ¾ inch thick; with a large, irregular, spongy bulb at the base, ¾ to 1½ inches in size; solid; firm; covered with silky fibres; whitish, tinged with lilac.

Gregarious, in damp woods, from August to October.

Cortinárius violáceus (L.) Fr.

VIOLET CORTINARIUS

EDIBLE

CAP: 2 to 6 inches broad; convex, becoming partly expanded, obtuse; dry; covered with numerous, erect scales; finally shining with metallic lustre. The entire plant is uniformly violet in colour. FLESH: thick; varying in colour from grey to dark purple, unchanging when bruised. GILLS: adnate, becoming sinuate; connected by veins; broad; distant; thick; at first very deep violet, changing to greyish-cinnamon. STEM: 3 to 5 inches long, ⅜ to ⅝ inch thick beneath cap; broader at bulb; solid; fibrillose; bulbous or clavate; bulb spongy; dark violet, also violet tinted within. VEIL: soft, woolly; bright-blue, later coloured by the spore dust. Odour and taste mild.

Solitary or gregarious, among debris and fallen leaves in woods, from August to October.

This species is easily recognized because of its conspicuous, almost metallic sheen when dry, and its deep violet tinge throughout, silky scaly cap, and strongly bulbous base. It is considered one of the best edible varieties.

Fig. 1. CORTINARIUS CINNAMOMEUS
Fig. 2. (All others) CORTINARIUS ARMILLATUS

Genus 25

Inócybe Fr.

The peculiar condition of the cap alone serves to identify the members of this genus. The surface of the cap shows rays of parallel fibres radiating from the centre towards the margin, really the result of a universal veil covering the entire plant in its early stage. Frequently the cuticle of the cap shows fissures corresponding to the longitudinal fibres, which apparently are strong and not elastic, thus frequently embedded in the cuticle.

The cap is generally cone- to bell-shaped. The gills are variably attached, adnate to sinuate to decurrent. The stem is central, continuous with and of the same substance as the cap. Its apex is covered with minute, mealy scales. The odour is pleasant in many species, but disagreeable in others. The genus bears resemblance to *Tricholoma*, which is white spored, and *Hebeloma*, another brown-spored genus, from which it differs by its characteristic cap and its veil, which is closely attached to the margin of the cap. Nearly all are small species growing on the ground and avoided because of their offensive odour.

Inócybe rimósa (Bull.) Fr.

STRIATED INOCYBE

(Pl. 74[2])

DISAGREEABLE

CAP: 1 to 2 inches broad; conical to bell-shaped, becoming partly expanded and broadly umbonate; surface covered with silky fibrils, soon cracking radially; colour yellowish-brown. MARGIN: thin; slightly wavy; splitting. FLESH: fragile; whitish. GILLS: adnexed; narrow; close; slightly ventricose; cinereous-pale-cinnamon. STEM: 1½ to 3 inches long, ¼ inch thick or less; solid; firm; equal; mealy at apex; nearly smooth; terminating in an abrupt bulb; whitish to dirty-yellow. Odour and taste disagreeable.

Solitary or gregarious, on the ground in woods, from July to September. The umbonate cap, radiately cracked, showing yellow beneath, is a distinguishing feature of this species, as well as its objectionable odour and taste.

Genus 26

Flámmula Fr.

The species generally grow on wood, some on the ground, and appear chiefly at the end of summer till fall. The cap is bright coloured and often viscid. The gills are slightly attached to decurrent. The stem is central, fleshy, or fibrous, continuous with cap. Veil indistinct, often in webby fragments along the margin of the cap. They resemble *Clitocybe* of the white-, *Hypholoma* of the purple-, and *Clitopilus* of the pink-spored series.

It is a difficult genus to determine; the spores differ in colour shades among the several species, varying from ochre or tawny to rust or brownish-rust colour.

A few of the species are palatable; in some the taste is bitter.

Fig. 1. CORTINARIUS LILACINUS
Fig. 2. INOCYBE RIMOSA

Fig. 1. *(Photo. courtesy of C. L. Shear, Washington, D.C.)*

Flámmula polychróa Berk.

VARIABLE FLAMMULA

(Pl. 75)

EDIBLE

CAP: 1 to 3 inches broad; strongly incurved when young, becoming convex and expanded, irregular, depressed in centre, broadly umbonate; very viscid; surface covered with fine, delicate hairs forming scales, especially along the margin. These scales vary in colour of tints of violet, lavender, lilac, and purple. The colour of the cap is very variable, centre yellow or orange, margin olive to greenish, when old yellow olive and brown mottled. FLESH: soft; moist; thick on disc; white to pale yellow. GILLS: adnate to slightly decurrent; crowded; narrowing towards the margin; at first creamish, soon greyish-brown to brown with a purplish tint. STEM: 1½ to 2½ inches long, scarcely ¼ inch thick; stuffed to almost hollow; slender; rigid; finely striate at apex; tough; cartilaginous; covered with numerous, small, dotted scales below the remains of the veil; yellowish above, same colour as the cap, often with a purplish or reddish-brown tint at base. VEIL: floccose; thick; scaly underneath, often adhering in patches to the margin; same colour as cap.

Solitary or in clusters, on dead branches, logs, etc., in woods, from July to October. Frequent.

Genus 27

Hebelóma Fr.

The cap is soft, fleshy, regular, somewhat viscid, often fibrous. Margin involute, rarely connected with the veil. The gills are of subdued colour, often spotted, sinuate to adnate or adnexed. The stem is central, continuous with the substance of the cap, fleshy to fibrous, with a mealy, scaly apex. The fibrillous veil is more or less distinct, often disappearing. Growing on ground solitary or in groups. Odour often disagreeable or pronounced. The species resemble in shape some *Tricholoma* species, from which they differ in the colour of the spores. They are also similar to *Entoloma* of the pink-spored series, but the difference in spore colour enables ready differentiation.

Hebelóma sinapízans (Paul.) Fr.

MUSTARD-FLAVOURED HEBELOMA

(Pl. 76)

EDIBLE

CAP: 2 to 4 inches broad; convex, becoming expanded; slightly viscid when moist; irregular; compact; smooth; fleshy; cuticle readily separating; colours varying greyish-fawn to pale-yellow at the centre. MARGIN: thick; wavy; smooth; obtuse. FLESH: compact; white. GILLS: notched; close; broad; dry; thin; ventricose; minutely serrate; colour sordid-white when young, changing to pale-cinnamon. STEM: stout; 1 to 2½ inches long, ¾ to 1 inch thick;

FLAMMULA POLYCHROA

HEBELOMA SINAPIZANS

solid, with a pithy core, becoming stuffed and hollow; equal, often oval in section; fibrous; rigid; beautifully marked with scales arranged in undulating rings; apex floccose; colour white. Odour faint, taste pungent.

Solitary or in groups, in moist ground, under hardwood trees, during September.

Its stout, white stem, marked with ringed, fibrillose scales, and broad, light-cinnamon gills, will help to identify it. It is of infrequent occurrence.

Genus 28

Naucória Fr.

The number of species included in this genus is large, but their small size makes them unimportant. It is common, and widely distributed. The cap is hemispherical and convex at first; margin much incurved, partly expanding. The gills are adnate, sometimes slightly so, never extending down the stem. The stem is central, cartilaginous, and separate in texture from the cap, hollow or spongy within. Ring absent. Growing on the ground, in grassy places, and rarely on wood. The spores are rust colour or shades of brown.

Naucória semiorbiculáris (Bull.) Fr.

NUT-SHELL NAUCORIA

EDIBLE

CAP: 1 to 2 inches broad; convex, remaining hemispherical for some time, finally becoming expanded, obtuse; slightly viscid when moist; smooth; often cracked when old; even; reddish-brown when young, becoming tan to yellow when old, darker in the centre. FLESH: thin on margin, thick in centre; colour pale-yellowish to whitish. GILLS: attached to the stem; rarely notched behind; crowded; broad; edges fringed with white; light-leather coloured at first, changing to rusty-brown. STEM: 3 to 4 inches long, ⅛ of an inch thick; hollow; cartilaginous; tough; slender; shining; equal; smooth; colour pale-tan to reddish-brown.

This is one of our earliest species, and is common in pastures, on lawns, and along roadsides. It is found, especially after rains, from May till frost.

Its hemispherical cap, slender stem, and rust-coloured gills afford a ready means of identification.

Genus 29

Paxíllus Fr.

This is a small genus, in which the species have irregular, frequently excentric caps, the margin remaining incurved for a long period, then gradually unfolding. The gills are generally decurrent, membranous, frequently branching and uniting, and are readily separable from the cap. The stem is stout, generally slightly excentric, sometimes lacking. It is confluent with, and of the same substance as the cap. The plants are all very soft and the gills moist.

They are found growing on wood or on the ground, in rich woods.

PAXILLUS ATROTOMENTOSUS

Paxíllus atrotomentósus (Batsch.) Fr.

BLACK-FOOTED PAXILLUS

(Pl. 77)

EDIBLE

CAP: 2 to 5 inches broad and more; excentric, convex, then expanded, becoming plane or depressed; dry; tomentose; reddish or dark-brown. MARGIN: wavy to lobed; thin; persistently involute. FLESH: thick; compact or spongy; brownish beneath cuticle, remainder white. GILLS: adnate, slightly decurrent; close; forked at base, often anastomosing; separating readily from cap; intravenose; yellowish-tawny. STEM: 1½ to 4 inches long, ½ to 1 inch thick; solid; stout; rooting; tapering to apex, excentric generally; covered except at apex with a dark-brown, velvety tomentum. Odour slight, taste mild, of poor flavour.

Solitary or caespitose, frequently attaining a large size, growing on decaying logs and stumps of coniferous trees, especially on pine; distinguished by the blackish hairs on stem.

Paxíllus involûtus (Batsch.) Fr.

INROLLED PAXILLUS

(Pl. 78)

EDIBLE

CAP: 2 to 4 inches wide; convex, becoming expanded, then depressed; fleshy; compact; slightly viscid when moist, shiny when dry; often disk raised above the depressed margin; surface covered with fine, downy, matted hairs; easily finger-marked; olive-umber to ochraceous-brown with reddish-brown patches. MARGIN: slightly wavy; incurved. FLESH: thick; soft; yellow, turning brown when bruised; taste slightly tart. GILLS: extending down the stem; close; thick; branching and uniting in net-like fashion at the apex of stem; detachable from cap; lemon or olive-yellow, discolouring when bruised. STEM: 1½ to 3 inches long, ⅝ to ¾ inch thick; solid; tough; tapering towards and frequently enlarged at base, central or excentric; yellow at apex, nut-brown and streaked reddish-brown at base.

This species is found growing singly and in groups in coniferous woods, from June to October.

Our photograph clearly shows the peculiar net-like formation of the gills as they reach the stem.

SUBDIVISION D

Purple-spored Genera

Genus 30

Psallióta Fr. The True Mushroom

(Formerly *Agaricus*)

This genus contains some of our best and most widely known species. The common mushroom, the variety usually cultivated, is the most favourably and widely known.

The spores are typically black-purple or brownish-purple. The cap is thick fleshed, very meaty, smooth or scaly. The gills are free from the stem, usually from white to pink when

PAXILLUS INVOLUTUS

young; as they mature the colour changes from purple-brown to finally a deep, blackish-brown. The stem is central, solid, often becoming hollow, fleshy, when young without the cartilaginous covering present in older specimens. It is different in texture from the cap, and readily separates from it. The ring is very prominent in most species, and may be single or double. *Lepiota* of the white-spored series is similar in appearance. *Stropharia* has similarly coloured spores, also a ring, but is distinguished by its slimy cap, attached gills, and a stem of the same substance as the cap, and not separable.

A few species grow in woods, but they are mostly found in fields, pastures, and meadows. None are brightly coloured, white or dingy-brown being the prevailing colour. All species are edible and certainly belong to our most favoured fungi for the table.

Psallióta arvénsis (Schaeff.) Fr.

HORSE MUSHROOM

(Pl. 79)

EDIBLE

CAP: 3 to 8 inches wide; bell-shaped, convex, then expanding to plane; firm; becoming smooth; even; almost shining; frequently covered with fine, close, concentric scales; dry; colour white or yellowish. FLESH: thick in centre, thin at margin; white, becoming tinged with yellow, where rubbed turning brownish spotted. GILLS: free from the stem; crowded; rounded behind, broad; at first whitish, then pinkish, finally blackish-brown. STEM: 5 to 7 inches long, ½ to 1 inch thick; spongy within, then hollow; equal; smooth; terminating in a short, small bulb; white; silky; shining above the RING, which is thick, large, very broad, velvety on the upper side, rougher on the lower. Odour and taste fragrant and pleasant.

Frequently found in fairy rings or large circles in meadows, pastures, and occasionally scattered in woods.

Psallióta campéstris (L.) Fr.

COMMON OR FIELD MUSHROOM

(Pl. 80)

EDIBLE

CAP: 1½ to 4 inches wide; hemispherical at first, then convex, becoming more or less expanded; dry; smooth; soft; silky; often torn into triangular scales as the cap expands; satiny-white, varying to pallid-brown in the scaly forms. MARGIN: thin; often wavy; frequently fringed with fragments of the ring adhering to it; much incurved till expanded. FLESH: firm; thick; white, unchanging in colour; odour and taste agreeable. GILLS: free from the stem; rounded behind, broader in the middle; thin; crowded; white in the button stage, changing from delicate pink or flesh to blackish-brown. STEM: 2 to 3 inches long, ⅓ to ⅔ inch thick; solid, with a soft or central core; equal or tapering to the base; smooth, especially above the

PSALLIOTA ARVENSIS

PSALLIOTA CAMPESTRIS
(Button stage marked x)

23837—11

ring; white or whitish; usually short and firm. RING: near the apex or at middle of the stem; broad; delicate; edges torn; sometimes disappearing.

This species is known everywhere as one of the best varieties suitable for artificial culture. Curiously, in the cultivated form the basidium bears only one or two spores, whereas the wild form has four. For directions in regard to artificial culture vide Chapter IX.

It is found in pastures, grassy places, and richly manured, unploughed fields, sparingly during the summer, but abundant in late fall.

Psallióta placomýces Pk.

FLAT-CAP MUSHROOM

(Pl. 81[1])

EDIBLE

CAP: 2 to 5 inches wide; at first broadly ovate, convex, becoming expanded to flat, sometimes umbonate; smooth; silky; dry; surface covered with brown, pointed scales, crowded towards the centre; ground colour whitish. MARGIN: acute; even. FLESH: thick at centre; firm; white. GILLS: free; rounded behind; crowded; thin; at first white, then pink, turning to purple-brown. STEM: 3 to 4 inches long, ¼ to ½ inch thick; spongy within, becoming hollow; tapering to the cap; bulbous; colour white, the bulb often brownish. RING: broad; pendulous; white; double.

This is a rather attractive species. Its scaly cap and broad, double ring will attract attention. It grows solitary or scattered, on the ground in open pine woods. Not frequent. It is found during July and August.

Psallióta Ródmani Pk.

RODMAN'S MUSHROOM

(Pl. 81[2])

EDIBLE

CAP: 1½ to 3 inches broad; rounded, then convex, partly expanding; firm; dry; smooth; rather thick; sometimes silky; entirely white or yellowish at the disk, turning cream or darker in age. MARGIN: at first involute and extending beyond gills; thin; acute. FLESH: firm; unusually thick; white; odour and taste agreeable. GILLS: free; almost touching stem; rounded abruptly behind; close; narrow; at first whitish, then reddish-pink, turning to purplish-brown. STEM: 1 to 2 inches long, ½ to 1 inch thick; solid; stubby, equal or slightly tapering to the base; smooth below the ring, often covered with mealy flakes above; white. RING: variable; double; thin or thick; entire or torn; at or below the middle of the stem.

Solitary or caespitose, on the ground, especially on city boulevards, frequently forcing its way through the pavement. From May to October, locally towards fall.

Its squatty appearance, double ring, and compact flesh are its distinctive characteristics.

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Fig. 1. PSALLIOTA PLACOMYCES

Fig. 2. PSALLIOTA RODMANI

Psallióta silvícola (Vitt.) Fr.

SYLVAN MUSHROOM

EDIBLE

CAP: 2 to 5 inches broad; at first convex, somewhat bell-shaped, becoming nearly plane, umbonate; thin; smooth; shining; whitish, often more or less tan, especially towards the centre. FLESH: white, faintly reddish-brown. GILLS: free; crowded; rounded behind; thin; broader in the middle. STEM: 4 to 6 inches long, ¼ to ⅔ inch wide; spongy within, often hollow; bulbous, cylindrical, equal or tapering to the cap; white. RING: thin, large; downy below; sometimes double.

This plant is fairly common, usually solitary, and is found in woods and groves or along their borders, from August to October.

Psallióta subruféscens Pk.

REDDISH-BROWN MUSHROOM

(Pl. 82)

EDIBLE

CAP: 2 to 4 inches broad; hemispherical at first, then convex, becoming quite plane, faintly umbonate; dry; dull; smooth; surface covered with minute, pointed, silky, reddish-brown scales, especially towards the centre; whitish, or, corresponding to the density of scales, dull reddish-brown. FLESH: soft; thick at centre, thin at margin; brittle; white. GILLS: free; crowded; thin; broad; rounded behind; white at first, changing to pink, finally purple-brown on maturing. STEM: 3 to 4 inches long, ⅓ to ½ inch thick at middle; spongy within, becoming hollow; tapering to the cap, terminating in an abrupt bulb; white. RING: broad; very large at first, later pendulous, double; white above, below covered with tawny scales.

This species is found in clusters, among decayed leaves in open woods, from August to October.

Genus 31 **Strophária** Fr.

Cap fleshy, regular, usually viscid. Flesh of central stem and cap continuous. Ring present. Gills generally adnate, brown to olive-brown. This genus resembles to some extent *Armillaria* of the white and *Pholiota* of the brown-spored series. The species are small, and are found principally on manure or on rich soil.

Strophária aeruginósa (Curt.) Fr.

GREEN STROPHARIA

(Pl. 83)

EDIBLE

CAP: 2 to 4 inches broad; campanulate, convex, expanding, becoming nearly plane, slightly umbonate; covered with a Paris-green, very slimy substance, readily peeling off the cuticle,

PSALLIOTA SUBRUFESCENS

STROPHARIA AERUGINOSA

embedded in which are frequently scattered, pointed, white scales with erect tips, arranged in more or less concentric rings except at disk; ground colour, at length brownish or yellowish. The cuticle also separates readily from the cap. FLESH: compact; thick; whitish. GILLS: adnate, an occasional one with a decurrent tooth, often sinuate; rounded behind; sub-distant; spore powdered; broad; whitish at first, changing to drab, at length purplish-brown, edge white. STEM: 1 to 2 inches long, stout, ½ inch and more thick; hollow; equal; soft; fibrous; greenish-blue without and within; smooth above ring, densely scaly below; rooting with strong, white fibrils. RING: superior; persistent; erect or pendulous; lacerated; striate and brown above, whitish and floccose beneath.

On piled refuse in woods, from October till frost.

For three years numbers appeared on a sawdust heap in a thin maple wood, not before the end of October, and continuing after several hard frosts. This species is regarded as suspicious and even poisonous by some, but one of us (W.S.O.) has eaten quantities of it with relish and without the slightest inconvenience.

It is a conspicuous plant, once found not soon forgotten on account of its bright verdigris colour and white-tipped scales.

Strophária semiglobáta (Batsch.) Fr.

SEMIGLOBOSE STROPHARIA

(Pl. 84[1])

EDIBLE

CAP: ½ to 1½ inches broad; round to permanently hemispherical; viscid when young; smooth; thicker at the centre; even; shining and becoming lighter when dry; colour light-yellow. MARGIN: moderately thick. GILLS: adnate; broad; close to sub-distant; soon discoloured by the maturing spores; unequal in length; edge minutely white dotted, dark olive-grey to purplish-brown. STEM: 2 to 4 inches long, ⅛ inch or more thick; slender; hollow; equal; cylindrical, straight, bulbous; rigid, but easily broken; smooth, often striate at apex; viscid when young; light yellow. RING: superior; sticky when moist; often incomplete; when older closely adhering to stem.

Common and widely distributed, but seldom abundant, in manured pastures, from May to October.

It is easily identified by its yellow, hemispherical cap, and blackish or purplish gills.

Genus 32

Hypholóma Fr.

Cap more or less fleshy. Margin incurved when young, often fringed by the remnants of the ring, which rarely clings to the stem. Stem central, fleshy, substance same as cap and confluent with it. Gills adnate to sinuate, notched towards the stem. Generally growing in dense clusters or patches on old wood above or beneath the ground. Spores are brownish-purple, often intense purple, nearly black.

Fig. 1. STROPHARIA SEMIGLOBATA
Fig. 2. HYPHOLOMA APPENDICULATUM

Hypholóma appendiculátum (Bull.) Fr.

FRINGED HYPHOLOMA

(Pl. 84[2])

EDIBLE

CAP: 1½ to 2½ inches broad; bell-shaped, convex, becoming plane; fleshy; thin; very fragile; translucent when moist, date-brown to tawny when dry, becoming pale and splitting radially as the plant becomes older. MARGIN: thin; smooth, frequently wrinkled; acute; to which the remains of the veil cling in patches. FLESH: very thin; soft; mild; white. GILLS: attached; crowded; thin; broad; equal; edges minutely serrate; at first white, changing to flesh colour then dark brown with a purplish tint. STEM: 2 to 3 inches long, ⅛ to ¼ inch thick; hollow; fragile; smooth; equal or slightly tapering to apex, which is covered with a bloom or frost; white.

Growing in large patches around base of stumps. It is very common, and is found from October till frost. This species is prominent in the field on account of its appendiculate margin. The appendages, however, are very perishable and difficult to show in a photograph unless taken at the place of its growth.

Hypholóma sublaterítium (Schaeff.) Fr.

BRICK-RED HYPHOLOMA

(Pl. 85)

EDIBLE

CAP: 2 to 3½ inches broad; convex, becoming nearly plane; smooth, sometimes with loose threads from the veil adhering to it; dry; dark brick-red in colour, MARGIN paler, darker at centre. When young, fragments of the veil cling to the margin, which is curved downwards. FLESH: compact; thick in centre; whitish at first, becoming yellowish when old. GILLS: attached to the stem; crowded; narrow; edges white and minutely serrate; whitish at first, then greyish to greenish, becoming purple-brown. STEM: 3 to 5 inches long, ¼ to ½ inch thick; hollow; equal or tapering to the base; with traces of a ring towards apex; the lower part is dark reddish-brown or rust colour, and covered with small fibrils. The covering or skin of the stem readily peels off. Taste mild, sometimes slightly bitter.

This species is widely distributed, and occurs abundantly around the base of stumps or on logs, growing in large clusters. It is a very variable species and susceptible to change of form by weather conditions. Its brick-red, thick, compact cap, and habit of growing in dense clusters will make it easily recognized. It is found from September to November.

Peck describes a species (*H. perplexum*), which we consider identical with the above. All European authors consider this species poisonous. This may only be another case of continuing what some early author stated. To our knowledge and experience on frequent occasions, the fungus is not only harmless but quite desirable for the table.

HYPHOLOMA SUBLATERITIUM

Genus 33

Psilócybe Fr.

Cap more or less fleshy, convex or bell-shaped, expanding to plane. Margin at first incurved. Gills adnate, rounded behind, generally slightly decurrent, when old spore-powdered. Stem central, hollow, even, cartilaginous, continuous with cap. Ring absent.

Somewhat similar to *Collybia* of the white and *Naucoria* of the brown spored series. Generally growing on the ground; most of them are small. They are common on lawns and fields after rains.

Psilócybe foenisécii (Pers.) Fr.

HAYFIELD PSILOCYBE

(Pl. 86[1])

EDIBLE

CAP: ½ to 1 inch broad; convex, bell-shaped or hemispherical, rarely becoming plane, subumbonate; smooth; dry; hygrophanous; faintly zonate on drying; flesh to chocolate, brown when moist, lighter when dry. FLESH: thin; light-chocolate colour. GILLS: adnate; often emarginate; ventricose; finely serrate; close; mottled by the spores; edges tipped with white; smoky-drab. STEM: 1½ to 3 inches long, about ⅛ inch thick; slender; hollow; equal; fragile; pruinose, and white at apex; pallid with a reddish tint. Odour none, taste mild.

Gregarious or solitary, very common on lawns and grassy places throughout summer after rains. Said to appear after the hay is cut. It is quite variable in colour and size; though small, large numbers frequently occur, and when cooked, make an excellent dish.

SUBDIVISION E

Black-spored Genera

Genus 34

Coprínus (Pers.) Fr.

The genus Coprinus is readily distinguished on account of its black spores and the peculiar character of the gills, which at maturity dissolve into an inky fluid. This process is known as auto-digestion, and assists in the freeing of the spores for dispersal. The cap is at first bell-shaped or cylindrical, and most forms have their surface covered with downy or scurfy scales, often rib-like striated. The flesh is thin, often membranous, watery, brittle. The gills are free or only slightly attached to the stem by a more or less definite collar, at first pressed closely to it and to each other, soon wider apart. The stem is central, hollow, smooth or fibrous, often very fragile, distinct from the cap. A universal veil is present in a majority of the species. They are usually very short-lived, and grow on manured ground, on rotted stumps, or on dung.

Fig. 1. PSILOCYBE FOENISECII
Fig. 2. (All others) COPRINUS COMATUS

Coprínus atramentárius (Bull.) Fr.

INKY CAP

(Pl. 87)

EDIBLE

CAP: 1½ to 3 inches broad; at first ovate, then expanding, lobed and folded; fleshy and firm; generally smooth, but often with minute scales or silky fibres, especially at the centre, or covered with a silky bloom; tan to greyish or smoky-brown. MARGIN: wavy or lobed, furrowed. FLESH: very thin; white. GILLS: free, obtuse towards the margin; broad, widest at the middle; very close to each other; thin; white to pink at first, changing to purple, then becoming black and dissolving into inky fluid, dripping off the margins of the mature plants. STEM: of varying length up to 5 inches, and from ¼ to ¾ inch thick; smooth; silky; shining; hollow; white. RING: at the base of stem, often indistinct, quickly disappearing.

This plant is very common, growing singly or in dense clusters, on lawns, in gardens, and in rich soil, but not on manure. The entire cap in its unexpanded condition is quite meaty and substantial, which makes this species a great favourite for the table. It is found during the fall months and till frost. Some authors mention it as occurring in early spring; in this locality it has not been recorded except in the fall.

Coprínus comátus (Fl.Dan.) Fr.

SHAGGY MANE

(Pl. 86[2])

EDIBLE

CAP: 2 to 4 inches long; decidedly cylindrical, at first oblong, becoming bell-shaped, then expanding more or less; dry; surface except at apex torn into broad, brownish or yellowish, shaggy scales, frequently concentric, showing white to faintly pink underneath. MARGIN: thin, when mature splitting along the gills. FLESH: very thin; soft; white. GILLS: free; obtuse towards margin; broad, frequently up to ½ inch; closely and firmly packed at first, later widening; colour white, tinged with pink, changing to purlpish-black, and soon dissolving into an inky mess. STEM: 3 to 6 inches long, ⅜ to ¾ inch thick; hollow, but filled with fine, silky filaments; equal or tapering to the cap; smooth or covered with fine fibrils; brittle; substance not continuous with cap and readily separating from it; slightly bulbous; colour white. RING: thin; movable.

This is one of the best known fungi, universally favoured. It is common on lawns, in gardens, and city dumps, especially amongst ashes, growing in large clusters or singly, until after quite hard frost.

COPRINUS ATRAMENTARIUS

Coprínus micáceus (Bull.) Fr.

GLISTENING COPRINUS

(Pl. 88)

EDIBLE

CAP: 1½ to 2½ inches broad; ovate, then bell-shaped, closely striate to deeply furrowed; thin; even at the centre; covered with small, mica-like, glistening particles, especially in its early stages; varying in colour from tan or light-buff to yellowish-brown, becoming darker when moist or old; eventually splitting, and less deliquescent than the previous species, especially when dry. MARGIN: wavy; splitting; becoming upturned when old; covered with glistening scales or bare. FLESH: thin; white. GILLS: slightly attached to the stem; crowded, but not packed, broad; lanceolate; white, then pinkish, finally nearly black. STEM: 2 to 3 inches long, ⅛ inch or more thick; hollow; equal; slender; fragile, readily splitting; often twisted; silky; white to pale tan.

This plant is very common, generally growing in dense clusters about stumps, trees, fence-posts, or from decayed buried wood. It reappears after rains in the same place, plentifully in spring and early summer, continuing less profusely till frost. Its edible qualities are considered among the best, its abundance compensating for its smaller size.

Genus 35

Panaéolus Fr.

The cap is firm, slightly fleshy, without striations, viscid or dry. The margin apparently extends beyond the gills, due to the remains of the ring continuing almost entirely attached to it, hence practically only a trace is left on the stem. The gills are adnate or adnexed, and mottled by the spores. The stem is central, long, slender, brittle, often lightly scaly, of the same substance and continuous with the cap. A small genus, most of them edible, but generally too few in number to make collection worth while. Growing on manure and fertile soil. Not deliquescent.

Panaéolus retirúgis Fr.

WRINKLED PANAEOLUS

(Pl. 89[1])

EDIBLE

CAP: ½ to 1 inch broad; at first oval, then conic to bell-shaped, subumbonate, obtuse; smooth and viscid in wet weather; surface irregularly wrinkled; smoky when wet, tan, grey, brownish, or creamy-white, and covered with shining particles when dry. MARGIN: appendiculate. FLESH: thin; soft; white. GILLS: adnexed; close; ventricose; broad; at first white, then mottled by the spores; margins white. STEM: slender, 2 to 6 inches long, ⅛ to ¼ inch

COPRINUS MICACEUS

thick; hollow; smooth; equal; often mealy at the apex; usually grey or reddish-brown, sometimes with a band coloured from a deposit of spores caught by the traces of the ring; somewhat bulbous.

Gregarious or scattered, widely distributed, frequent on dung and heavily manured pastures, or on lawns; through summer and fall. Rather a striking species from its veined, wrinkled cap.

Panaéolus solídipes Pk.

SOLID-STEM PANAEOLUS

(Pl. 89[2])

EDIBLE

CAP: 2 to 4 inches broad; at first hemispherical, finally becoming and remaining broadly convex, obtuse; smooth; large; firm; whitish, the cuticle breaking into yellowish scales; centre of disk frequently cracked in a net-like fashion. FLESH: thick; greyish. GILLS: adnexed; close; ventricose; broad; spore powdered; at first whitish, turning black. STEM: 5 to 8 inches long, about ¼ inch thick; solid; fibrous; striate and pruinose at apex; often twisted; drops of a watery fluid sometimes appear on the upper part of the stem.

Gregarious or caespitose, usually on manure. Spring to fall. One of the largest of the genus.

Second Division

PORE FUNGI

I. Fleshy, in shape like the common mushroom

Genus 1 **Bolétus** (Dill.) Pat.

The plants of this genus are extraordinarily variable in almost every feature, and much patience and study is necessary to distinguish them. Some fine edible species are included, but several poisonous, or at any rate suspected, forms occur. The colour of the spores, so helpful in grouping the gill fungi, is in this genus only of secondary importance, but since it may assist in distinguishing the species, it is given in every case.

The plants are all of the shape of a typical muchroom inasmuch as they have the characteristic cap and stem. They are all soft, fleshy, and easily decay. Usually they grow on the ground, singly or scattered or in larger or smaller associations.

The cap is always fleshy; the surface ranges from dry to silky and velvety, but in many species there occurs a very viscid cap. The stem is central, equal, usually stubby, often swollen in the middle, smooth or finely scaly, often regularly reticulated, with or without a ring. The pore layer in this genus is readily detachable from the cap (vide Pl. 4*). The tubes composing the fruiting layer are long, corresponding to the term "broad" used in reference to gills. The openings or pore mouths may be round, angular, irregular, or toothed. The pores may be decurrent, adnate, or faintly sinuate, rarely free.

Fig. 1. PANAEOLUS RETIRUGIS
Fig. 2. (All others) PANAEOLUS SOLIDIPES

Bolétus chrysénteron (Bull.) Fr.

RED-CRACKED BOLETUS

(Pl. 90)

EDIBLE

CAP: 2 to 3 inches broad; convex, becoming expanded; dry; velvety; surface cracked into areas; cracks showing reddish, ranging from brick-red, reddish-brown, yellowish-brown to tawny or olivaceous. FLESH: yellow, slightly changing to blue when bruised. Tube layer convex, i.e., broader in the middle. TUBES: slightly attached to and forming a depression around the stem; changing to blue when wounded; mouths large, angular; yellow to greenish. STEM: 2 to 3 inches long, ¼ to ½ inch thick; solid; fibrous; striated; equal; tough; rigid; colour reddish or yellowish. Spore colour, deep yellow-brown.

This species is common but very variable. It can easily be identified by its reddish-coloured cap, frequently cracked, with the fissures showing red. It is found growing solitary and in groups, under thin woods, in moist, shady ground, from July to October.

Bolétus edúlis (Bull.) Fr.

EDIBLE BOLETUS

(Pl. 91)

EDIBLE

CAP: 4 to 6 inches broad; convex, becoming nearly plane; smooth; moist; compact when young, massive, becoming soft when old; colour varying according to place of growth from light-brown, greyish-brown, to dark brownish-red, margin paler. FLESH: abundant; white or yellowish, reddish beneath the cuticle when older. TUBES: attached to, with a depression around the stem, convex; mouths angular, long, minute; white, then changing to yellowish and greenish. Taste pleasant, nutty. STEM: 2 to 6 inches long, ½ to 1½ inches thick; solid; stout; even or ventricose, club-shaped towards the base; entire surface usually covered with lines forming a fine network or reticulations. In older plants this is shown at the apex of stem only. Colour, whitish or brownish. Spore colour, yellow to ochre-brown.

This plant is not rare, occurring in woods and open places during July and August. It is one of the best edible varieties of the genus.

Bolétus félleus (Bull.) Fr.

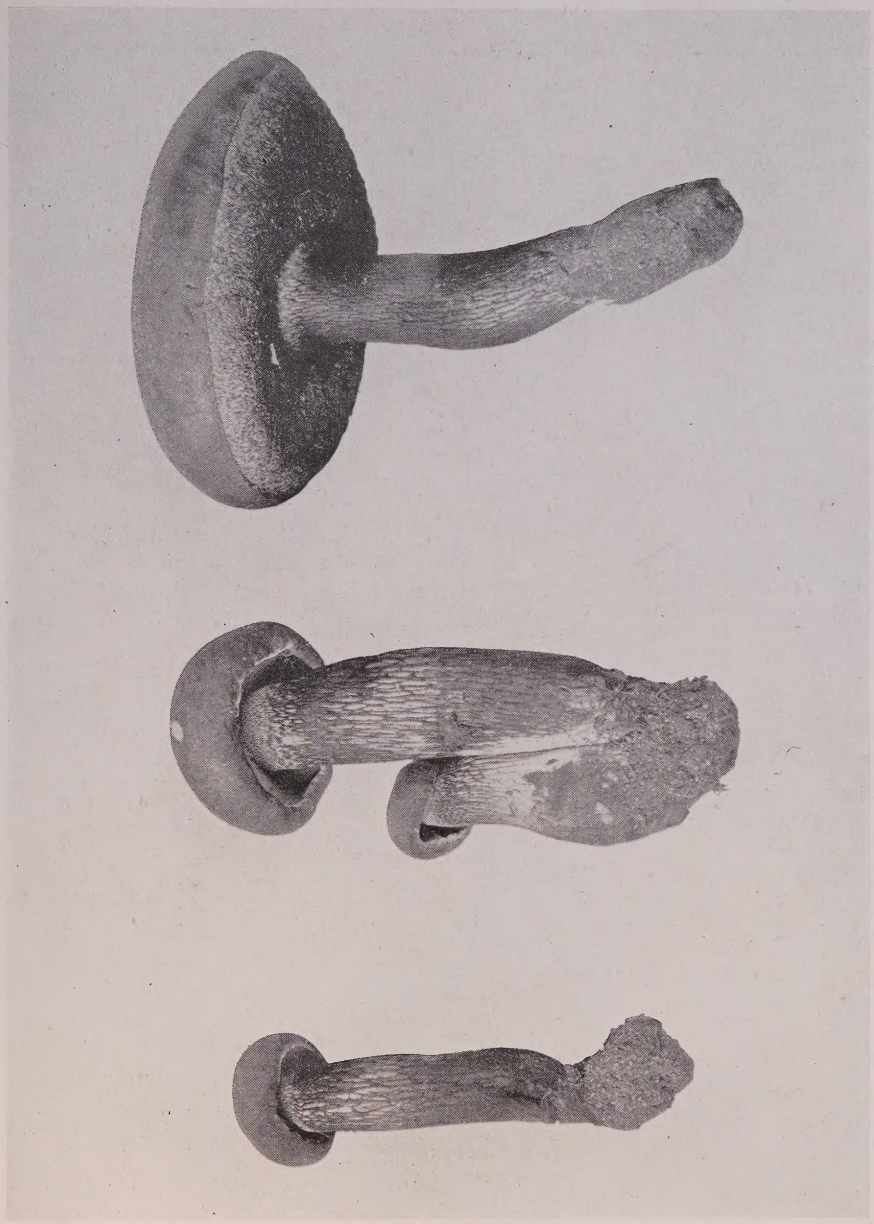
BITTER BOLETUS

(Pl. 92)

BITTER

CAP: 3 to 9 inches broad, often larger; hemispherical, later nearly plane; thick; firm, becoming soft when old; smooth; colour variable, from flesh colour to purple in its early stages, to tan or nut-brown or pale-yellowish, grey-brown, yellow, reddish-brown. MARGIN: entire;

BOLETUS CHRYSENTERON



BOLETUS EDULIS

BOLETUS FELLEUS

almost incurved when young. FLESH: thick; white, faintly pinkish when bruised; bitter, becoming milder when old. TUBES: attached to the stem, and with a depression around it; very long; mouths minute, angular; colour white, tinged with pink. STEM: variable; 2 to 4 inches long, ½ to 1 inch thick; smooth, often netted to striate; equal or tapering to the cap, ventricose, frequently expanding into a large bulb; of the same colour as the cap, often paler. Spore colour, flesh.

This species is common in woods and along open margins from July to September, and is widely distributed. It is an attractive one, of inviting appearance, and grows singly, frequently in groups of many individuals. While not poisonous its taste is too bitter to be palatable, and cooking does not remove it. It closely resembles *B. edulis*, but can readily be separated because of its bitter taste.

Bolétus granulátus (L.) Fr.

GRANULATED BOLETUS

(Pl. 93)

EDIBLE

CAP: 2 to 4 inches wide; convex, expanding but not becoming plane; very sticky at first; cuticle readily peeled; soft; fleshy; colour reddish-brown, turning more yellowish as the mucilage disappears. MARGIN: thin; smooth; acute, generally involute. FLESH: soft, spongy; unchanging; thick; nearly white, except at the tubes and below cuticle, where it is pale-yellow; taste mild. TUBES: attached to the stem, frequently with a decurrent tooth; short; yellowish; mouths small, round, dotted with brownish granules, the dried up remains of a milky juice often exuding from the pores of the young plant. STEM: 2 to 3 inches long, ¼ to ⅝ inch thick; solid; granular; equal or slightly tapering to the apex; tough; flexible; pale yellowish, white within. Spore colour, yellow-brown.

This species is very common, generally growing in groups under pines and in open spaces, from September till frost.

Bolétus lúteus (L.) Fr.

YELLOW BOLETUS

(Pl. 94)

EDIBLE

CAP: 2 to 5 inches wide; convex at first, becoming nearly plane, frequently wrinkled, subumbonate; very viscid when young; shining when dry; firm; fleshy; smooth; varying in shades of yellow to brown, reddish, greyish, becoming sordid when old. MARGIN: smooth; often wavy; acute. FLESH: firm; yellowish; unchanging. TUBES: attached to the stem, with a slight decurrent tooth; surface plane to convex; unchanging in colour, yellow at first, becoming darker with age; short; mouths round, small. STEM: 2 to 2½ inches long, ½ to ¾ inch thick; solid; marked above and below the ring with moist or sticky dark spots; equal

BOLETUS GRANULATUS

BOLETUS LUTEUS

or slightly tapering to the base; colour yellow to pale red-brown, yellowish within. RING: thick, felted, large, membranous, persistent; in the form of a broad, free collar; white or bright-yellow. Spore colour, yellowish-brown.

This plant is common, growing in sandy soil singly or in groups, generally beneath pines. It is widely distributed and of universal favour, and is amongst the best flavoured of the Boleti as an article of diet; found from August to October. *Boletus subluteus* Peck, is identical with the above.

Bolétus rétipes B. et C.

NETTED-STEM BOLETUS

(Pl. 95)

EDIBLE

CAP: 2 to 4 inches wide; convex, becoming nearly expanded, with a slight depression in the centre; dry or but slightly viscid when moist; surface finely yellow powdered; from tawny-brown to yellowish. MARGIN: thick; sometimes slightly wavy; smooth; obtuse. FLESH: firm; thick; unchanging; mild, often slightly bitter; lemon or yellow. TUBES: attached to the stem, slightly decurrent, depressed around stem when old, extending beyond the cap, long; mouths small, nearly round; colour unchanging when bruised, greenish-yellow, darker-yellowish when old. STEM: long, 3 to 6 inches, ¼ to ½ inch thick; solid; equal or slightly tapering to the cap; flexible; cylindrical; beautifully marked, with raised lines forming a net-work; base enlarging to a bulb; no ring; colour tawny-brown above, base yellow, and yellowish within. Spore colour, yellow-brown.

This plant is not rare, growing in leaf mould, in woods and in grassy places, usually singly, during July and August.

Boletus ornatipes Peck is identical with this species.

Bolétus scáber (Bull.) Fr.

ROUGH-STEM BOLETUS

(Pl. 96)

EDIBLE

CAP: 2 to 4 inches wide; convex, becoming nearly plane; viscid when moist; dull; very soft; thick, fleshy; smooth or minutely velvety; colour whitish to various tints of brown or red. MARGIN: thick; often appendiculate. FLESH: thick at centre; spongy; white, turning flesh colour on bruising; taste mild. TUBES: free from the stem; long, slender, and depressed around the stem; mouths round; colour white to yellow-greenish-brown. STEM: 3 to 5 inches long, ½ to ¾ inch thick; solid; tapering upwards; firm; often striate; roughly covered with

BOLETUS RETIPES

BOLETUS SCABER

black dots or scales; slightly bulbous; colour whitish at apex, blackish or brownish below. Spore colour, reddish-brown.

This is a very common and widely distributed species. It grows singly in woods, swamps, in groves or along borders, among grass, through summer and fall. Owing to its great variation, especially in colour, the tendency has been to establish numerous varieties, but this is scarcely warranted.

Bolétus subaúreus Pk.

GOLDEN-RED BOLETUS

(Pl. 97)

EDIBLE

CAP: 2 to 4 inches wide; convex, becoming plane, sub-umbonate; covered with a thick, transparent, viscid slime, frequently dripping off the surface; fleshy; flexible; smooth; yellow, with red to reddish-brown blotches, darker at the umbo. MARGIN: thin; wavy; frequently covered with long, soft hairs, or with remnants of the veil, which leaves no trace on the stem. FLESH: soft, spongy; thick; pale-yellow, becoming pinkish-blue on exposure to air; taste mild, tart. TUBES: attached to the stem with a decurrent tooth; mouths very large, angular, edges blunt; colour pale-yellow, becoming dull-ochre, marked with darker blotches from an exuded fluid when handled. STEM: 1½ to 2½ inches long, ¼ to ½ inch thick; solid; tough; slender to stout; flexible; equal or slightly tapering to the cap; dotted all over with sticky, reddish-brown spots, turning darker when old, yellow beneath the dots and within. Spore colour, rusty-brown.

This plant grows in thin woods and open places, solitary or associated, from August to November. Some authors regard it as among the most valuable of our food species, being found when other fungi are scarce.

We consider *B. americanus* of Peck synonymous with above.

Genus 2

Boletínus Kalchbr.

The name indicates a diminutive form of *Boletus*, but this genus differs from it essentially in the peculiar spore-bearing surface, which is most unlike the dense, crowded pore layer of *Boletus*. In *Boletinus* the fruiting layer is formed by very shallow, large pores, covering the entire lower surface of the cap in a more or less net-like fashion. These pores extend down the stem for some distance. They are soft and easily crushed, and do not separate from the texture of the cap as a layer. The stem sometimes shows fragments of a ring. The flesh is yellow.

BOLETUS SUBAUREUS

Boletínus píctus Pk.

PAINTED BOLETINUS

(Pl. 98)

EDIBLE

CAP: 2 to 3 inches broad; at first convex, later expanding to nearly plane; dry or slightly viscid; covered with reddish, cottony fibres, soon forming into a dense mass of small scales, showing the yellowish flesh beneath. MARGIN: uneven; covered with remnants of the veil. FLESH: tough; thick; yellowish, becoming slowly pink when bruised. TUBES: superficial; attached to the stem, often slightly decurrent; short; colour at first pale-yellow, changing to pinkish-brown when bruised, and becoming dull yellowish-brown when old; mouths very large, angular, compound. STEM: 1½ to 2½ inches long, ¼ to ½ inch thick; solid; equal or tapering to the cap; yellowish above; covered with fibrous scales like the cap but paler in colour. RING: thin; fibrous to flaky; generally remaining for a short time only.

This is a handsome species; its bright coloured cap is conspicuous. It is one of the best edible kinds, and is found in damp woods and mossy ground during August and September.

Boletínus porósus (Berk.) Pk.

VEINED BOLETINUS

(Pl. 99)

EDIBLE

CAP: 2 to 5 inches broad; irregular to lobed, becoming depressed in the centre when old; fleshy; viscid when moist; thin; shining; smooth; velvety; dull-yellowish or reddish-brown. MARGIN: thin; incurved; wavy; acute. FLESH: thick at the middle; spongy; yellow, changing to bluish-green when bruised; odour strong; taste mild. TUBES: shallow; extending down the stem; honey-yellow; soft; not separable from the cap; arranged in radiating lines, forming a typical network of small, angular spaces or pores; changing to dull blue when wounded. STEM: ½ to 1½ inches long, ¾ to 1 inch thick; excentric or lateral; solid; extending into the cap; tough; covered at the top by a network of veins; yellowish.

This is a common species occurring all through the summer in damp woods and open places, singly and in groups.

Genus 3

Strobilomýces Berk.

One of the most conspicuous of fungi, and very readily recognized by its singular appearance, being prominently tufted and scaly and of an unusual colour, ranging from dull, blackish-red to bluish-grey, finally almost black like a piece of dead wood. The stem is central, very rough, scaly. The tubes are white, at first covered by a veil, and do not separate from the cap as in *Boletus*. Growing on ground. Only one species occurs in Canada.

BOLETINUS PICTUS

BOLETINUS POROSUS

23837—13

Strobilomýces strobiláceus (Scop.) Berk.

PINE CONE FUNGUS

(Pl. 100[1])

EDIBLE

CAP: 2 to 4 inches across; hemispherical at first, becoming expanded; dry; very soft and spongy; surface covered with coarse, hairy, upright, blackish-brown scales. MARGIN: thick; fringed with scales and with remnants of the floccose veil. FLESH: soft, thick, spongy; white or whitish. TUBES: attached to the stem and depressed around it; white at first, flesh and tubes changing to blackish when wounded; mouths large, angular. STEM: 3 to 5 inches long, ¼ to ¾ inch thick; solid; thick; irregular; slightly tapering to cap; brittle; coarsely scaly and coloured like the cap.

This species is found in open woods growing singly, during July and August. It is not common in this locality.

II. Fleshy, but not in shape resembling the common mushroom

Genus 4

Fistulína (Bull.) Fr.

In this genus of the pore fungi we are introducing forms which are not like the true mushroom in shape, i.e., do not possess the typical round cap nor the usual stem. In the gill fungi we became acquainted with similar forms resembling this genus somewhat in general appearance (*Lentinus*, *Panus*), but distinct because of the gills. The fruiting body in this genus is fleshy, yet tough, either with a lateral or no stem. The tubes are very characteristic and different from any other genus, being free from each other and in the early stages especially, more like toothed projections. Growing on wood.

Fistulína hepática (Huds.) Fr.

BEEFSTEAK FUNGUS

(Pl. 100A)

EDIBLE

Fruiting body very thick, ½ inch and more; sessile; tongue-shaped; fleshy; soft; juicy; viscid when moist; liver to blood-red. MARGIN: uneven. FLESH: very thick; juicy; soft but tough; in section like fat and lean beef; variegated yellowish to red; taste slightly acrid. TUBES: short at first; free from each other; yellowish or flesh-coloured; mouths paler and round.

This species is rare locally, and grows from wounds on oak and chestnut trees, during midsummer. It is a widely distributed species, and has long been known for its edible qualities.

23337—13½

Fig. 1. STROBILOMYCES STROBILACEUS

Fig. 2. GANODERMA LUCIDUM

III. Corky or woody, etc.

(*a*) Surface with brittle crust

Genus 5

Ganodérma (Karst.) Pat.

The typical specimens show a more or less characteristic, dull or highly polished, brittle crust, covering the lobe or shelf-like fruiting body. The stem is usually lateral, more often absent. The tubes are frequently in several layers or strata. The plants may be annual or perennial, growing on wood, rarely on ground.

Ganodérma applanátum (Pers.) Pat.

PLANE BROWN GANODERMA

WOODY

A very common, perennial, horizontal, woody, shelf or bracket fungus, always laterally attached, often by its entire breadth; of variable size, from 2 to 8 inches broad, ½ to 4 inches thick, often reaching 12 to 24 inches in dimension. Surface showing characteristic crust, like a hardened cuticle, irregular, with occasional raised points, smooth, and marked with concentric "welts," each one probably representing a year's growth; brown to ochre-greyish; frequently covered below and above with a dense mass of rusty-brown spores. A section through the fruiting body will reveal a series of pore layers arranged in strata; these are dark rusty-brown with whitish lines. The texture of the fungus itself is fibrous and spongy; brown in colour. TUBES: of the lower surface are superficially white and easily marked brown when scratched. We have seen beautiful sketches drawn in this manner by artists, standing out deep brown against the white background. It is found on dead and living trees, stumps, and fallen limbs, and is undoubtedly destructive in many cases, though requiring a wound to gain entrance into the wood. Formerly known as *Fomes applanatus*.

Ganodérma lúcidum (Leyss.) Karst.

LACQUERED GANODERMA

(Pl. 100[2])

NOT EDIBLE

A striking species on account of the shiny, bright red or chestnut colour, and the brittle, lacquered crust covering the upper surface of the fruiting body. It is from 2 to 8 inches broad; kidney-shaped, very irregular; surface uneven, wrinkled, with coarse grooves; yellowish and soft at first, reddish, later blood-red, changing to chestnut-brown; appearing generally as if varnished; corky; of remarkably light weight. MARGIN: often notched. FLESH: woody and

FISTULINA HEPATICA

(Photo courtesy of J. E. Bishop, Washington, D.C.)

tough; white. PORES: greyish-brown when young, changing to tan. STEM: lateral; polished; irregular; well anchored into the crevices of the bark of trees or decayed wood, etc.; covered with raised swellings, which later develop into fruiting bodies; colour chestnut brown.

This plant is frequent, growing on decayed logs and tree trunks, particularly hemlock and pine, in damp woods, from August to November. Its brilliant varnished surface will attract the collector. Formerly included in the genus *Polyporus* (*P. lucidus*).

(*b*) Surface without brittle crust

Genus 6

Polýporus (Micheli) Fr.

This genus is very variable. It includes, however, no typically fleshy specimens; nearly all of them are tough, woody, or dry and brittle. Certain species may be found flexible and almost fleshy, but this is usually the result of wet weather—they very quickly dry and become brittle or corky again. The stem may be present or absent. The plants cover either old stumps, etc., with dense shelf-like masses, or may be spread over wood without any stem but attached by their entire length or breadth, or they form conspicuous brackets so often found on dead and living trees. Among them occur many forms destructive to trees of all kinds, and for this reason the genus is economically important.

The spores are produced in tubes or pores not readily separable from the rest of the plant or from each other. They are usually too tough to be edible, with the exception of a few.

Polýporus sulphúreus (Bull.) Fr.

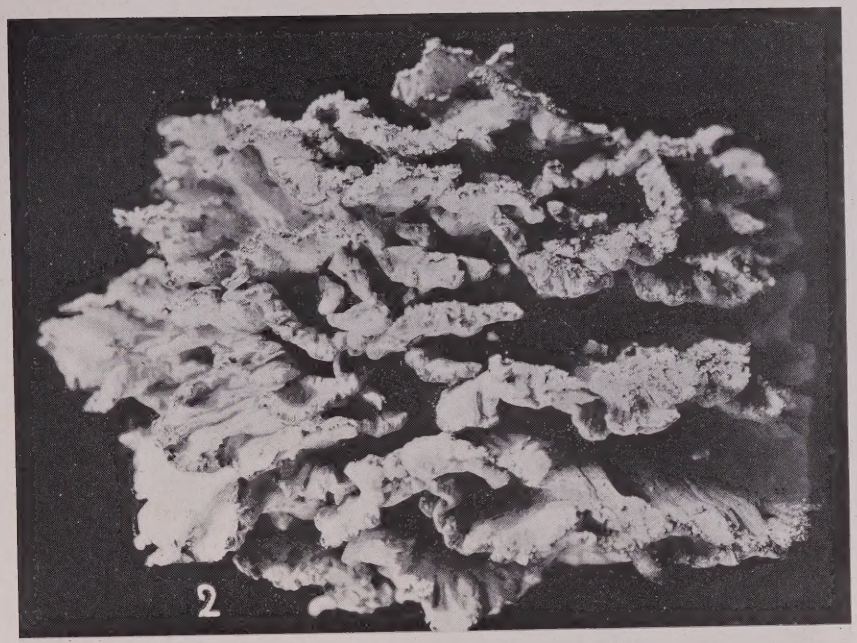
SULPHUR POLYPORE

(Pl. 101)

EDIBLE

To find a clump of this beautiful fungus is a sight not easily forgotten. The fruiting body is 2½ to 4 inches broad; various in form, very much imbricated, flattened, elongate, generally horizontal, frequently fan-shaped, undulating or with radiating grooves; growing in large clusters; fleshy; beautiful and delicate bright-sulphur or salmon-pink. MARGIN: smooth; thick and blunt when young, becoming thinner. FLESH: cheesy, not becoming hard when old; white. PORES: very minute, plane; bright sulphur-yellow, with a remarkably fine, silky sheen. Odour strong; taste slightly acid. Commonly sessile, often with a short stem laterally attached. Edible, especially when quite young.

August to October. Common.



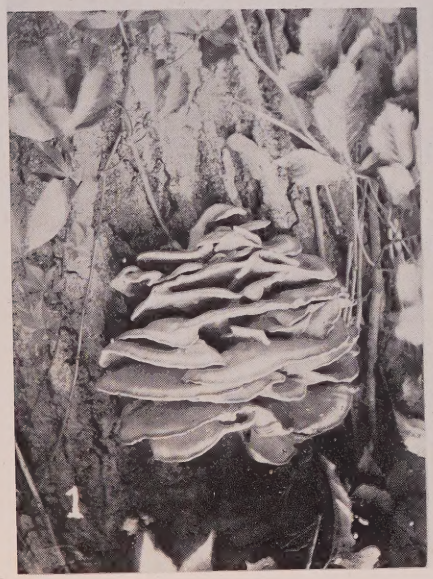


Fig. 1. POLYPORUS SULPHUREUS, growing on oak trunk. *(Photo. J. F. Hockey)*
2. POLYPORUS SULPHUREUS. *(Photo. courtesy of G. S. Bell, Toronto, Ont.)*
3. POLYPORUS SULPHUREUS, showing lower surface.

Polypórus umbellátus Fr.

MANY-CAPPED POLYPORE

(Pl. 102)

EDIBLE

Growing in dense spreading clumps of many caps, the clumps 6 inches to 1 foot in dimension; usually from a common white stem; abundantly branching and forking, each end terminating in a cap. The individual CAP is from ½ to 2 inches broad; almost funnel-shape; smooth; smoky-yellow to reddish, rarely white. FLESH: soft, brittle, of good flavour. PORES: minute; white.

Growing on decayed roots on the ground and near stumps from May to October. When found it is desirable to dig out carefully the whole plant and keep on the look-out for a sclerotium from which this plant frequently grows.

Third Division

TEETH-BEARING FUNGI

Genus 1

Hýdnum (L.) Fr.

It is a simple matter to recognize the forms belonging to the group of teeth-bearing fungi. There are never gills nor pores present, and the fruiting layer usually consists of more or less long, soft prickles or teeth, on the surface of which the basidia are borne. The forms are most variable in shape and size; several show a cap and stem like the common mushroom, others appear like spongy, densely prickly masses, or they may resemble a miniature frozen waterfall in its wonderful, white, crystalline beauty. On drying, nearly all become more or less corky. The stem is central or lateral, or may hardly be recognized as such. The spines or prickles are often fairly long, stouter at the base, with an acute point. The plants usually grow on wood or on the ground. With a few exceptions the species are inedible.

Hýdnum cáput-úrsi Fr.

BEAR'S-HEAD HYDNUM

(Pl. 103)

EDIBLE

A fungus of rare beauty, clumps of irregular shape, like tiers of milk-white, dainty, pendulous icicles, formed by the soft, long, awl-shaped spines or teeth, growing on fallen, decaying logs, looking like masses of snow from a distance. FLESH: white; soft.

September to October. A very similar species, *H. caput-Medusae* (Bull.) Fr., has been recorded from time to time, but we have never been certain as to whether the slight differences warranted its distinction from the above.

POLYPORUS UMBELLATUS

HYDNUM CAPUT-URSI

(Photo. courtesy of G. S. Bell, Toronto, Ont.)

Hýdnum coralloides (Scop.) Fr.

CORAL HYDNUM

EDIBLE

Clumps 2 to 5 inches wide, growing in clusters on living trees and on decayed logs. Arising from a common stem, repeatedly branching from long, slender shoots into coral-like clusters. Branches ¼ to ½ inch thick at base, fleshy. TEETH: ⅛ to ¼ inch long; pointing towards the ground when mature.

This species is most beautiful. It is pure white at first, turning dark-cream when old. It is rare in this locality and smaller than the size given by most authors. It is found from August to October.

Hýdnum repándum (L.) Fr.

SPREADING HYDNUM

(Pl. 104)

EDIBLE

CAP: 2 to 4 inches wide; convex, becoming nearly plane, often depressed in the centre, frequently irregular; fleshy; dry; fragile; smooth; colour variable, light-brown, pinkish or yellowish-buff. MARGIN: rather thick; wavy, turned in, frequently upturned when old. FLESH: fragile; thick, compact; white. TEETH or spines attached to the stem, frequently extending down the stem, unequal in length, conical, mostly pointed; leaving small cavities when detached; ⅓ to ¼ inch in length; colour whitish or cream. STEM: 2 to 3 inches long, ½ to 1¼ inch thick; solid; central, sometimes excentric, continuous with cap; tough; fleshy; slightly tapering to the cap; covered with a velvety substance; white.

This species is common, growing in woods and around much decayed wood, singly, sometimes is small clusters, from July to October.

Hýdnum septentrionále Fr.

NORTHERN HYDNUM

(Pl. 105)

TOUGH

In this species a number of irregular, wavy, superimposed and indefinite fruiting bodies unite into a fairly large clump, 9 to 12 inches in width; attached by its side to the trunk of beech trees; easily broken off, without leaving a trace on the trunk; tough, dry, or corky; furrowed; general appearance greyish. MARGIN: thick; rolling, uneven, obtuse; with an olive tint. FLESH: thick; leathery; composed of coarse fibres; white, changing to orange when old. TEETH: rather dishevelled; ½ inch or longer; close; slender; bright-orange in the crevices, becoming darker towards the margin.

Invariably on living beech, where it causes a sap wood rot. Infrequent locally. Late in fall.

HYDNUM REPANDUM

HYDNUM SEPTENTRIONALE

Fourth Division

CORAL FUNGI

Genus 1

Clavária (Vaill.) Fr.

The members of this genus are readily recognized by their shape. They usually show erect, coral-like, many branched, finely tipped, tough to fleshy masses, or they may be simple and club-shaped. To the naked eye there is no indication of the presence of a hymenium (fruiting layer), which, however, covers the tips of the branches and is of microscopic size. The spore colour varies from white to ochre to brown. Growing on ground or fallen logs in damp woods, often in a large number of single clumps. Edible when young, growing tough with age.

Clavária amethýstina (Batt.) Bull.

AMETHYST CLAVARIA

EDIBLE

The entire plant is beautifully violet-amethystine, and easily recognized on account of it. It is from 1 to 2 inches high; few to many branched, forked at the apex, round, even rather obtuse; smooth. Found in grassy woods on the ground from August to October. Odour strong, taste slightly rancid.

Clavária aúrea (Schaeff). Fr.

GOLDEN CLAVARIA

(Pl. 106[1])

EDIBLE

Plant from 2 to 4 inches high; growing in compact, conical tufts. Trunk solid, thick elastic; repeatedly branched; stout and straight; slightly toothed, regularly forked, terminating in slender, round branchlets; colour golden-yellow to tawny. FLESH: white; taste pleasant.

This plant grows singly and in clusters under conifers or in mixed woods, from August to October.

This species is frequently confused with *C. flava*, which is said to be a less robust and more slender branched species. There is, however, one feature which should aid in distinguishing these two, and that is the turning reddish of *C. flava* when bruised. Collectors are specially advised to carefully observe any such changes in colour on bruising.

Fig. 1. CLAVARIA AUREA
Fig. 2. CLAVARIA CINEREA

Clavária cinérea (Bull).

ASHEN CLAVARIA

(Pl. 106[2])

EDIBLE

Plants 1½ to 3 inches high; among decaying debris in open woods; rather inconspicuous; ashy-grey to tallow waxy; solitary or scattered. STEM: rather stout; much branched, rarely straight, often gnarled and bent, very variable; brittle; FLESH: white; tasteless. The branches are often compressed and wrinkled, apex many pointed, often toothed. August to October.

Clavária cristáta (Holmsk.)

CRESTED CLAVARIA

(Pl. 107[2])

EDIBLE

Plant about 3 inches high, growing in tufts composed of many broad, flattened branches, having tips divided into numerous, finely cut branchlets somewhat in the form of a crest. STEM: short; brittle; spongy within. Colour pure-white, becoming grey. FLESH: white; taste mild.

It is common in moist, shady woods from June to October.

Clavária fláva Schaeff.

YELLOW CLAVARIA

EDIBLE

Plants 2 to 5 inches high, same width; growing in tufts; fleshy; fragile. Branches round, not flattened, numerous; smooth; growing close together; erect; nearly parallel; terminating in toothed points. Colour pale-yellow or dingy-yellow; when bruised a change in colour towards pinkish-brown takes place. STEM: short; thick; white. FLESH: white; odour and taste pleasant.

Growing in thin woods and open places from July to September.

Clavária pistilláris (L.) F.

INDIAN CLUB CLAVARIA

(Pl. 107A)

EDIBLE

This is one of the simple, club-shaped forms of fair size, often 6 inches high, with a club about 1 to 2 inches thick. Growing solitary on ground in mixed woods, August to September, rather conspicuous by its shape and dull-ochre colour. The clubs are frequently grooved, spongy, fleshy, with pale-cream flesh. The taste is mild.

Fig. 1. CLAVARIA STRICTA
Fig. 2. (All others) CLAVARIA CRISTATA

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CLAVARIA PISTILLARIS

(Photo. courtesy of J. E. Bishop, Washington, D.C.)

Clavária strícta Pers. (Fr.)

STRAIGHT CLAVARIA

(Pl. 107[1])

EDIBLE

Height 2 to 3 inches; plants growing in dense tufts. Trunk short; flattened; spongy within. Branches crowded; arising from coarse mycelial strands; not finely branched, forking several times, bases flattened; smooth; elastic; tips dividing into two or three pale-yellow, pointed ends. Colour light-tan, base whitish. Taste slightly, though distinctly, bitter.

Growing on decayed wood, in open hardwood, during August and September. Common.

Fifth Division

JELLY FUNGI

Genus 1

Auriculária Bull.

The fungi in this group are characteristic because of their soft, jelly-like consistency when wet. They are quite membranous when dry, but quickly regain their original shape when wetted. Usually growing on fence rails, wooden fences, stumps, etc., and at once recognized by their gelatinous nature. The genus *Auricularia* is chosen among many others because of its common occurrence. It is edible, but of little value for the table.

Auriculária aurícula—Júdae (L.) Schroet.

JEW'S EAR

(Pl. 108)

EDIBLE

The plant grows singly or in clusters of a few, and is composed of a single lobe 1 to 3½ inches across, resembling the shape of the outer ear. It is quite sessile, irregular in shape, somewhat cup-shaped, and wrinkled like the ear. MARGIN: wavy; smooth; covered with a fringe of fine, rather stiff hairs. Colour date- to olive-brown. The cuticle may be peeled off in wet weather, when the interior will be found to be a transparent, jelly-like mass. Quite membranous when dry. On fallen logs from August to October.

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AURICULARIA AURICULA-JUDAE

SECOND SUBGROUP

GASTEROMYCETES

In the first three genera, a peculiarly organized fruiting portion is carried at the apex of a long, stem-like organ known as "receptacle." Equally confined to these genera is a volva of a strange nature, unfamiliar so far to our readers. At first the plants are wholly enclosed in a common, rather thick membrane, just the same as a shell encloses the egg. In fact, the early stage is referred to in these fungi as "egg stage." These "eggs," said to be edible by some observers, but to our minds rather objectionable, occur more or less deeply buried in decaying leaves or in the ground; and when found should be cut in halves lengthwise and carefully examined, when it will be noticed that the entire young plant is contained therein, safely tucked away in the centre.

We are now able to distinguish (*vide* Pl. 110) that there exists a stout, white, and fluffy outer cover. Next to this occurs a layer of a clear, jelly-like mass, separated from the young plant by a thinner white wall. Right in the centre we observe a long, hollow space almost from the very base to its apex. This hollow space is surrounded by a finely spongy substance, known as the "receptacle." Closely adpressed to it lies what eventually forms the fruiting portion of the stem, already distinctly separate from the spongy mass and only connected with it at the extreme apex. It consists of two layers visible in our section: note the inner layer or pileus, on the surface of which the peculiar fruiting portion is borne, in this stage showing as an olive-green, cheesy mass, known as "gleba," in which substance the spores are produced.

The first signs of development from the egg stage manifest themselves by the rupture of the outer membrane and the appearance of the pileus. From then on development is extremely rapid; the impression which is conveyed to the observer is as if the tucked away receptacle is perfectly developed within the interior, and once the wall is ruptured the compressed, spongy substance of the receptacle expands rapidly until further expansion is no longer possible. In this manner the receptacle assumes the shape of a stem. The entire receptacle is now quite hollow, the cavity running through its entire length and terminating in a round hole at the apex. It has now become coarsely cellular, and appears more or less minutely perforated throughout. At the base remains the gelatinous portion of the covering, and forms the strange volva already referred to. Eventually the jelly-like substance disappears, when the outer and inner membranes alone will remain.

Next our attention is directed to the pileus or cap. Here we find certain features enabling us to establish the generic differences. By this time the pileus, or really the fruiting portion of the fungus, forms a more or less cone-shaped bell, hardly expanded at its lower margin beyond the thickness of the stem, and attached at the apex by a more or less prominent white disk, in the centre of which we may observe the round mouth or opening already described. The pileus carries the olive-green, spore-producing layer or gleba. This substance absorbs water readily and becomes sticky and fluid, eventually being washed off by the rain and dripping off along the edges. When washed off, the surface of the pileus is revealed, which is divided into a number of larger or smaller, shallow or deeper pits, undoubtedly providing thus a means of retaining the gleba until the spores are matured. These pits are often beautifully and regularly marking the surface.

Fig. 1. DICTYOPHORA DUPLICATA
Fig. 2. CYNOPHALLUS CANINUS

As to generic characters, we may observe that the members of the first genus, *Dictyophora*, carry a veil extending from below and more or less beyond the base of the cap, which is free from the stem. This veil is often most beautifully net-like, and when wholly intact, in several species a great and conspicuous adornment. In others the margin of the cap is free, but the veil is entirely absent (*Ithyphallus*), while in the third (*Cynophallus*), the pileus is attached to and merely the termination of the stem, in colour different but of the same dimension, tapering though towards the apex.

Genus 1

Dictyóphora Desv.

Plants at first of egg-like shape, later with characteristically spongy, perforated, straight and tapering, hollow stem or receptacle, arising from a volva of several distinct layers, the middle one of which is clear and gelatinous, the others more or less stoutly membranous. The receptacle terminates in the fruiting portion, consisting of a bell-shaped pileus or cap free from the stem, attached only at its apex, and at first covered with a spore-bearing layer, the gleba. This becomes sticky and fluid when wet, and is eventually washed off by rains, exposing the surface of the cap, which is more or less prominently ridged and pitted. The most prominent feature of this genus is the presence of a large or small meshed, net-like veil, originating from below the cap and extending beyond its margin like a collar. Growing on ground. Odour rather offensive.

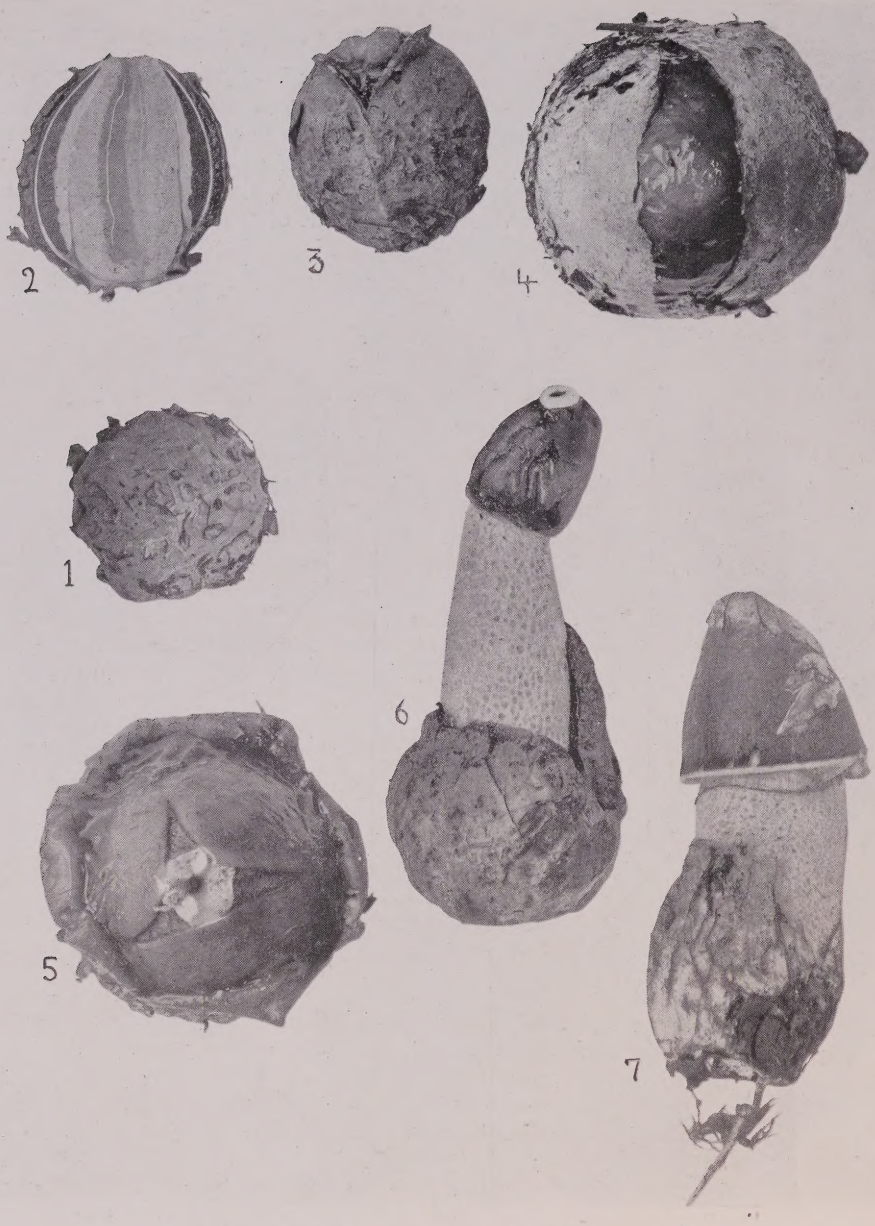
Dictyóphora duplicáta (Bosc.) Ed. Fischer

NET-BEARING DICTYOPHORA

(Pl. 109[1])

INEDIBLE

When discovered in its full glory, undamaged, and perfect, this is a most beautiful and artistic fungus, unfortunately rather offensive in odour. It is from 6 to 8 inches high, and possesses a pure-white, finely perforated, netted "stem," hollow inside and rather delicate. At the apex, attached only by a circular disk, with a round hole in the centre, there is borne the bell-shaped cap or pileus, slightly expanded at the margin. The surface of the cap is at first covered with the dark olive-green to brownish, spore-bearing layer or gleba. The gleba disappears when the spores are matured, becoming sticky and fluid, and is easily washed off by rains, revealing the deeply ridged and pitted surface of the pileus. The veil issues from below the cap and is wide meshed, forming a white, net-like collar, very fragile and hence often torn. The volva is gelatinous, loosely attached at the base with a free and distant margin. In open woods and gardens, on ground, from September to October.



DICTYOPHORA RAVENELII

Fig. 1. Single "egg" from above. 2. Section through same.
Figs. 3 and 4. Volva rupturing at apex. Fig. 5. Showing apical mouth of receptacle.
Figs. 6 and 7. Mature plants.

Dictyóphora Ravenélii (B. et C.) Burt.

SHORT-VEILED DICTYOPHORA

(Pl. 110)

INEDIBLE

Very similar in general appearance to the preceding. On the disappearance of the gleba, at first covering the pileus, the surface of the latter shows merely granulated and wrinkled, but none of the prominent ridges of the former species. The stem is 6 to 8 inches high; white; spongy; hollow, perforated. The veil is thin, like a membrane, lying close to the stem, often very short, not coarsely net-like. The volva is nearly spherical, attached at the base, otherwise free from the stem. Outer covering wrinkled, gelatinous within, and the inner coat faintly pink. Odour offensive. Common in open woods on ground and rotting sawdust from June to October.

Genus 2

Ithyphállus Fr.

Distinguished from *Dictyophora* by the entire absence of a veil, otherwise closely alike. Cap attached only at the apex.

Ithyphállus impudícus (L.) Fr.

STINK HORN

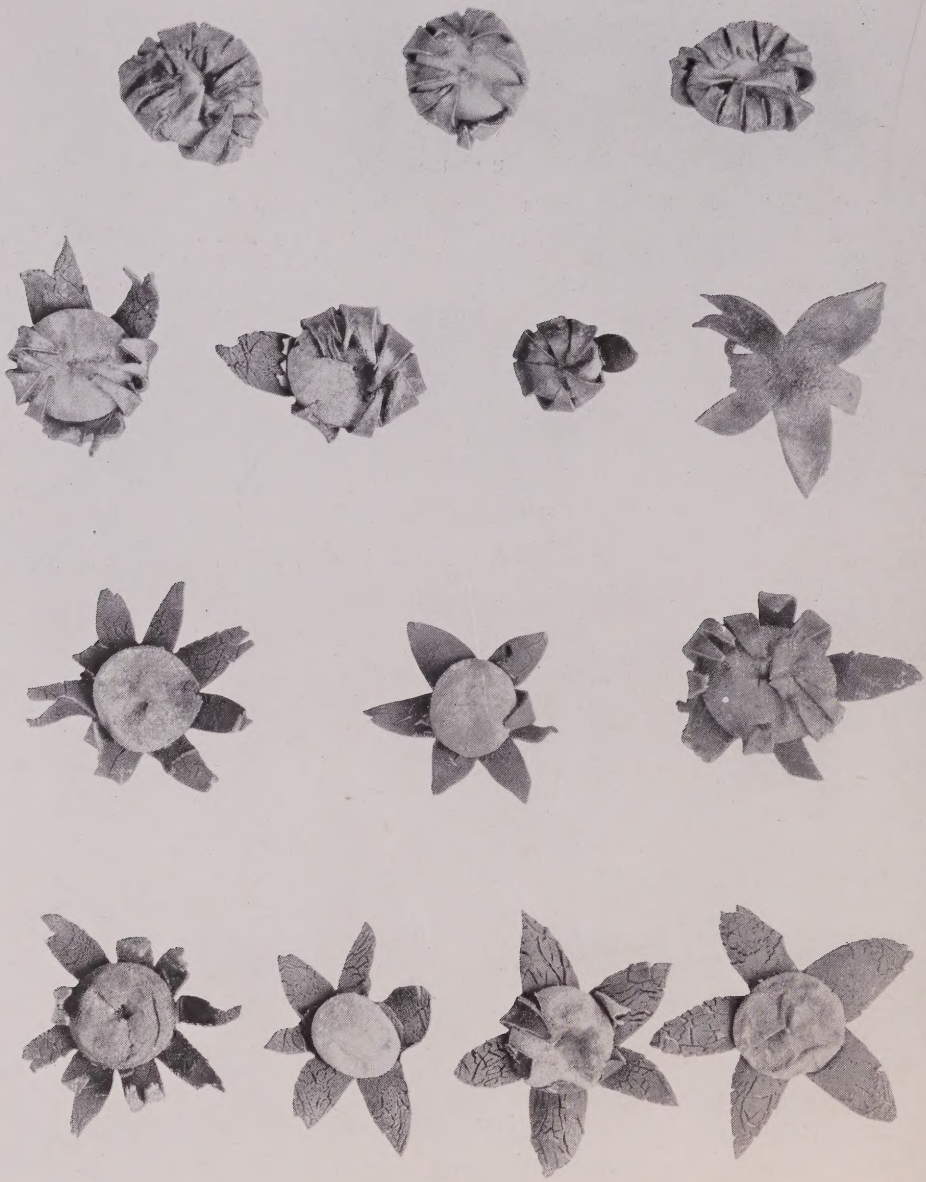
OFFENSIVE

STEM: 6 to 8 inches high; tapering towards apex and base; hollow, finely perforate; white; arising from a spherical, white to yellowish VOLVA. CAP: attached only at apex by a small disk; perforated with a round hole in the centre. GLEBA: light olive-green; surface of pileus white, with reticulations. No trace of a veil. Odour most offensive, usually leading to the discovery of the plant. We have found the egg masses in large numbers in decaying sawdust, also on ground below bushes or verandahs, from June to October.

Genus 3

Cynophállus (Fr.) Cda.

This genus, though considerably smaller, resembles the former two in general shape. Its cap, however, is not free from the stem, and is of the same dimension, although tapering towards the apex and of red colour. It is covered with the mucilaginous, green gleba. Veil absent. Volva present. Growing on the ground in woods.



GEASTER HYGROMETRICUS

Cynophállus canínus (Huds.) Fr.

PINK-CAPPED STINKHORN

(Pl. 109[2])

NOT EDIBLE

STEM: 2 to 3 inches long, ¼ to ½ inch thick; hollow, cylindrical, honeycombed, tapering to the cap; apex closed or open, pointed; covered with the slimy, olive-green gleba. The colour of the pileus beneath the gleba is bright-pink to red, the stem is pink to flesh colour. The VOLVA is white; edges lacerated, loosely adhering to the base of the stem.

It is found in woods during July and August.

For the sake of simplicity and ready popular distinction we have divided the group of Gasteromycetes dealt with, into plants with stem-like receptacles and plants wherein no definite, elongated stem exists. This latter group includes the forms popularly referred to as "puffballs," as well as the so-called "bird-nest fungi," which are common objects of interest because of their curious structure.

(*a*) Receptacles entire, opening at maturity with round hole at apex

(Plants star-shaped)

Genus 3

Geáster (Micheli) Fr.

The young plant is globose to bulb-shaped, often with a tip at the centre, usually brown to reddish-brown. It consists of an outer, thickish wall composed of two or three layers, enclosing within the spore-containing fruiting body, which is covered by a thin membrane, opening later at the apex with a more or less round hole.

At maturity the outer wall commences splitting at the tip into fairly regular segments, generally from three to more, revealing the globular fruiting body. These segments open up in a star-like fashion, and since the plants occur on the ground, the name "Earth Star" has been given to them.

GEASTER TRIPLEX

Fig. 1. Young plant with mycelium. 2. Section of same.
Remainder of figures illustrate further development.

Geáster hygrométricus Pers.

BAROMETER EARTH STAR

(Pl. 111)

EDIBLE

In this species the outer wall consists of three layers. Since there are other structural differences, some authors considered it necessary to establish for it the genus *Astraeus*. The unexpanded plant is globose, without an apical tip; ¾ to 1 inch in size; dirty-grey to greyish-brown. The outer wall breaks into many segments, often fifteen and more. The segments extend to below the fruiting body, which is covered with a thin, brownish membrane, opening on maturity with a hole at the apex. Much confusion existed in recognizing the three layers composing the outer wall, inasmuch as the middle layer remained connected with the extreme outer one, and merely cracks into numerous areas. The third layer, i.e., the innermost, alone peels off the middle layer. In dry weather the segments roll inward and expand in a star-like manner when wet, hence its popular designation.

Superficially on the ground on sandy soil in open woods, from July to August.

Geáster tríplex Jungh.

COLLAR EARTH STAR

(Pl. 112)

EDIBLE

The brown to reddish-brown, bulb-like plant is stemless, at first half buried, later superficial on the ground; globose, with the apex terminating acutely; 1 to 1½ inch in size; the thick, fleshy, outer wall splitting from the apex into very uniform segments; pale dirty brown within; disclosing the globular fruiting body. The segments open out flat, and in doing so we observe the two layers composing it, viz. the inner more fleshy and the outer more fibrous. The fleshy layer cracks into halves at the base of each segment and remains like a cup-shaped collar around the fruiting body. The rest of the segment breaks up into areas. Eventually the characteristic star shape results. The fruiting body is covered with a thin, papery membrane, and on maturity discharges clouds of spores through a fringed, round opening at the apex when slightly pressed.

Common from July to September, singly or scattered on ground in open woods. Edible when young.

(Plants not star-shaped)

Genus 4

Lycopérdon (Tournef.) Pers.

Plants from beginning to maturity globular, pear, top, or flask-shaped, opening at the apex with a distinct mouth. At first the interior is quite solid and white, gradually, as the spores are formed, becoming tinged ochre, and drying up when they are fully mature. The spores are dis-

LYCOPERDON GEMMATUM

charged at the slightest touch in dense, coloured clouds through the apical mouth. The exterior surface is either smooth or covered with symmetrically arranged, tufted warts or scales, or fine granules easily rubbed off. Growing on ground in open spaces or on stumps and logs. All species are edible so long as they are pure-white inside.

Lycopérdon gemmátum Batsch.
GEMMED PUFFBALL
(Pl. 113)
EDIBLE

The shape of a solitary plant resembles a top, 1 to 2 inches high by 1 to 1½ inches wide; often very irregular owing to crowding of many specimens together; at the apex faintly umbonate or slightly depressed, with a round hole in the centre. The base is finely granulate and lighter in colour than the top, which is pure-white at first, changing to buff and tan with a deeper tint towards the apex. The surface is covered with long and short, scaly tufts, easily disappearing as the plants mature but leaving a net-like marking behind. On sectioning the plant one will find that only a portion of the interior produces spores, while the rest at the base remains sterile.

Very common and widely distributed. Growing on wood or on ground, from August to October.

Lycopérdon pýriforme (Schaeff.) Pers.
PEAR-SHAPED PUFFBALL
(Pl. 114)
EDIBLE

Plants arising from prominent, spawn-like strands; at first white, globular, and more pronouncedly scaly, later pear-shaped, bluntly tapering towards the base; from 1 to 2 inches high; tan to brownish; apex perforated with a small, torn hole. In older plants the surface is minutely scaly, becoming reticulated as the scales disappear, finally drying up and becoming papery. Base sterile—well shown in our plate.

This is a common puffball and world wide. It grows on decayed logs, stumps, and woody refuse, generally in dense clusters, from July to October.

Lycopérdon Wríghtii B. et C.
WRIGHT'S PUFFBALL
(Pl. 115[2])
EDIBLE

Plants pure white; ½ to 1½ inches in diameter, ¾ to 1 inch high; globose, frequently slightly flattened, sessile; surface densely covered with pyramidal white warts or spines, easily rubbed off, leaving a smooth, often velvety surface.

Very common, growing in pastures and grassy places in dense clusters, from July to October.

LYCOPERDON PYRIFORME

Fig. 1. CLAVARIA STRICTA
Fig. 2. (All others) CLAVARIA CRISTATA

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CLAVARIA PISTILLARIS

(Photo. courtesy of J. E. Bishop, Washington, D.C.)

Clavária strícta Pers. (Fr.)

STRAIGHT CLAVARIA

(Pl. 107[1])

EDIBLE

Height 2 to 3 inches; plants growing in dense tufts. Trunk short; flattened; spongy within. Branches crowded; arising from coarse mycelial strands; not finely branched, forking several times, bases flattened; smooth; elastic; tips dividing into two or three pale-yellow, pointed ends. Colour light-tan, base whitish. Taste slightly, though distinctly, bitter.

Growing on decayed wood, in open hardwood, during August and September. Common.

Fifth Division

JELLY FUNGI

Genus 1

Auriculária Bull.

The fungi in this group are characteristic because of their soft, jelly-like consistency when wet. They are quite membranous when dry, but quickly regain their original shape when wetted. Usually growing on fence rails, wooden fences, stumps, etc., and at once recognized by their gelatinous nature. The genus *Auricularia* is chosen among many others because of its common occurrence. It is edible, but of little value for the table.

Auriculária aurícula—Júdae (L.) Schroet.

JEW'S EAR

(Pl. 108)

EDIBLE

The plant grows singly or in clusters of a few, and is composed of a single lobe 1 to 3½ inches across, resembling the shape of the outer ear. It is quite sessile, irregular in shape, somewhat cup-shaped, and wrinkled like the ear. MARGIN: wavy; smooth; covered with a fringe of fine, rather stiff hairs. Colour date- to olive-brown. The cuticle may be peeled off in wet weather, when the interior will be found to be a transparent, jelly-like mass. Quite membranous when dry. On fallen logs from August to October.

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AURICULARIA AURICULA-JUDAE

SECOND SUBGROUP

GASTEROMYCETES

In the first three genera, a peculiarly organized fruiting portion is carried at the apex of a long, stem-like organ known as "receptacle." Equally confined to these genera is a volva of a strange nature, unfamiliar so far to our readers. At first the plants are wholly enclosed in a common, rather thick membrane, just the same as a shell encloses the egg. In fact, the early stage is referred to in these fungi as "egg stage." These "eggs," said to be edible by some observers, but to our minds rather objectionable, occur more or less deeply buried in decaying leaves or in the ground, and when found should be cut in halves lengthwise and carefully examined, when it will be noticed that the entire young plant is contained therein, safely tucked away in the centre.

We are now able to distinguish (*vide* Pl. 110) that there exists a stout, white, and fluffy outer cover. Next to this occurs a layer of a clear, jelly-like mass, separated from the young plant by a thinner white wall. Right in the centre we observe a long, hollow space almost from the very base to its apex. This hollow space is surrounded by a finely spongy substance, known as the "receptacle." Closely adpressed to it lies what eventually forms the fruiting portion of the stem, already distinctly separate from the spongy mass and only connected with it at the extreme apex. It consists of two layers visible in our section: note the inner layer or pileus, on the surface of which the peculiar fruiting portion is borne, in this stage showing as an olive-green, cheesy mass, known as "gleba," in which substance the spores are produced.

The first signs of development from the egg stage manifest themselves by the rupture of the outer membrane and the appearance of the pileus. From then on development is extremely rapid; the impression which is conveyed to the observer is as if the tucked away receptacle is perfectly developed within the interior, and once the wall is ruptured the compressed, spongy substance of the receptacle expands rapidly until further expansion is no longer possible. In this manner the receptacle assumes the shape of a stem. The entire receptacle is now quite hollow, the cavity running through its entire length and terminating in a round hole at the apex. It has now become coarsely cellular, and appears more or less minutely perforated throughout. At the base remains the gelatinous portion of the covering, and forms the strange volva already referred to. Eventually the jelly-like substance disappears, when the outer and inner membranes alone will remain.

Next our attention is directed to the pileus or cap. Here we find certain features enabling us to establish the generic differences. By this time the pileus, or really the fruiting portion of the fungus, forms a more or less cone-shaped bell, hardly expanded at its lower margin beyond the thickness of the stem, and attached at the apex by a more or less prominent white disk, in the centre of which we may observe the round mouth or opening already described. The pileus carries the olive-green, spore-producing layer or gleba. This substance absorbs water readily and becomes sticky and fluid, eventually being washed off by the rain and dripping off along the edges. When washed off, the surface of the pileus is revealed, which is divided into a number of larger or smaller, shallow or deeper pits, undoubtedly providing thus a means of retaining the gleba until the spores are matured. These pits are often beautifully and regularly marking the surface.

Fig. 1. DICTYOPHORA DUPLICATA
Fig. 2. CYNOPHALLUS CANINUS

As to generic characters, we may observe that the members of the first genus, *Dictyophora*, carry a veil extending from below and more or less beyond the base of the cap, which is free from the stem. This veil is often most beautifully net-like, and when wholly intact, in several species a great and conspicuous adornment. In others the margin of the cap is free, but the veil is entirely absent (*Ithyphallus*), while in the third (*Cynophallus*), the pileus is attached to and merely the termination of the stem, in colour different but of the same dimension, tapering though towards the apex.

Genus 1

Dictyóphora Desv.

Plants at first of egg-like shape, later with characteristically spongy, perforated, straight and tapering, hollow stem or receptacle, arising from a volva of several distinct layers, the middle one of which is clear and gelatinous, the others more or less stoutly membranous. The receptacle terminates in the fruiting portion, consisting of a bell-shaped pileus or cap free from the stem, attached only at its apex, and at first covered with a spore-bearing layer, the gleba. This becomes sticky and fluid when wet, and is eventually washed off by rains, exposing the surface of the cap, which is more or less prominently ridged and pitted. The most prominent feature of this genus is the presence of a large or small meshed, net-like veil, originating from below the cap and extending beyond its margin like a collar. Growing on ground. Odour rather offensive.

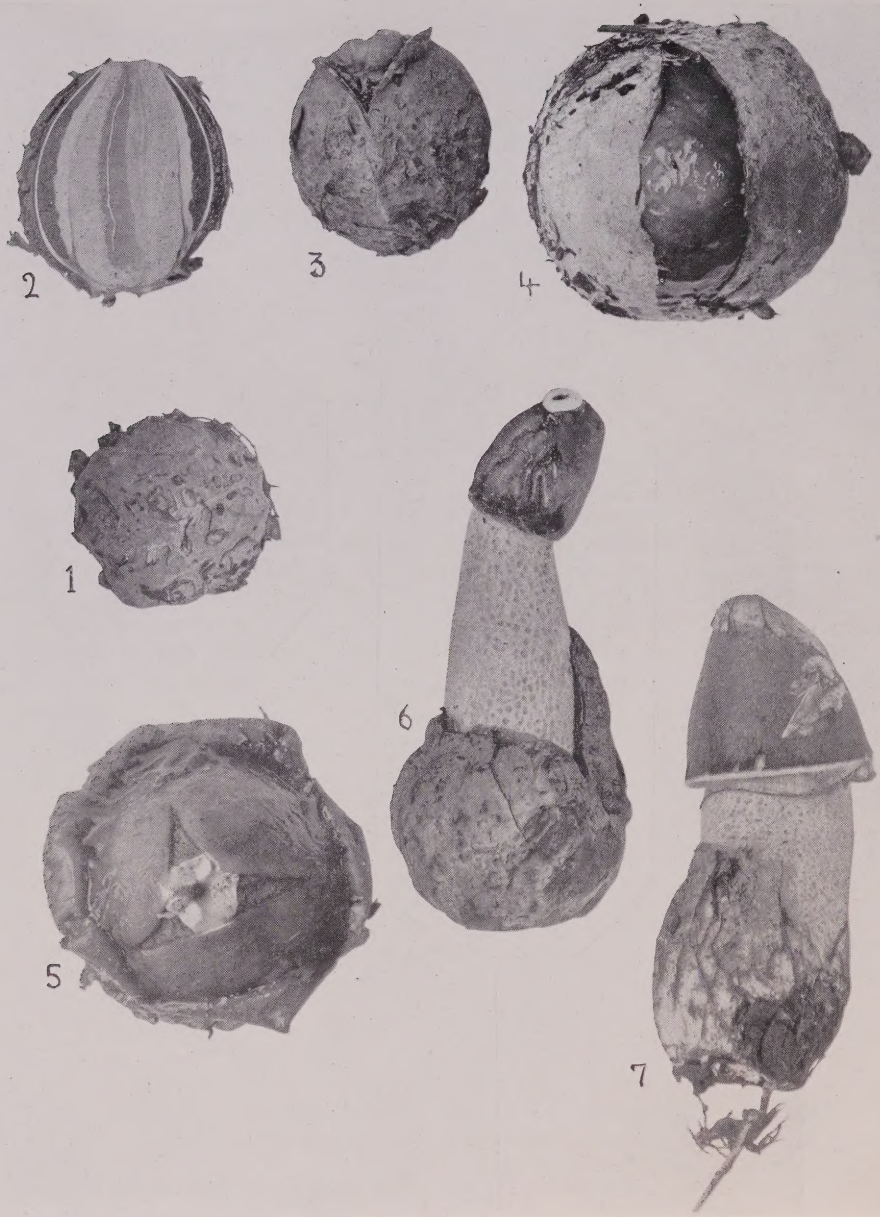
Dictyóphora duplicáta (Bosc.) Ed. Fischer

NET-BEARING DICTYOPHORA

(Pl. 109[1])

INEDIBLE

When discovered in its full glory, undamaged, and perfect, this is a most beautiful and artistic fungus, unfortunately rather offensive in odour. It is from 6 to 8 inches high, and possesses a pure-white, finely perforated, netted "stem," hollow inside and rather delicate. At the apex, attached only by a circular disk, with a round hole in the centre, there is borne the bell-shaped cap or pileus, slightly expanded at the margin. The surface of the cap is at first covered with the dark olive-green to brownish, spore-bearing layer or gleba. The gleba disappears when the spores are matured, becoming sticky and fluid, and is easily washed off by rains, revealing the deeply ridged and pitted surface of the pileus. The veil issues from below the cap and is wide meshed, forming a white, net-like collar, very fragile and hence often torn. The volva is gelatinous, loosely attached at the base with a free and distant margin. In open woods and gardens, on ground, from September to October.



DICTYOPHORA RAVENELII

Fig. 1. Single "egg" from above. 2. Section through same.
Figs. 3 and 4. Volva rupturing at apex. Fig. 5. Showing apical mouth of receptacle.
Figs. 6 and 7. Mature plants.

Dictyóphora Ravenélii (B. et C.) Burt.

SHORT-VEILED DICTYOPHORA

(Pl. 110)

INEDIBLE

Very similar in general appearance to the preceding. On the disappearance of the gleba, at first covering the pileus, the surface of the latter shows merely granulated and wrinkled, but none of the prominent ridges of the former species. The stem is 6 to 8 inches high; white; spongy; hollow, perforated. The veil is thin, like a membrane, lying close to the stem, often very short, not coarsely net-like. The volva is nearly spherical, attached at the base, otherwise free from the stem. Outer covering wrinkled, gelatinous within, and the inner coat faintly pink. Odour offensive. Common in open woods on ground and rotting sawdust from June to October.

Genus 2

Ithyphállus Fr.

Distinguished from *Dictyophora* by the entire absence of a veil, otherwise closely alike. Cap attached only at the apex.

Ithyphállus impudícus (L.) Fr.

STINK HORN

OFFENSIVE

STEM: 6 to 8 inches high; tapering towards apex and base; hollow, finely perforate; white; arising from a spherical, white to yellowish VOLVA. CAP: attached only at apex by a small disk; perforated with a round hole in the centre. GLEBA: light olive-green; surface of pileus white, with reticulations. No trace of a veil. Odour most offensive, usually leading to the discovery of the plant. We have found the egg masses in large numbers in decaying sawdust, also on ground below bushes or verandahs, from June to October.

Genus 3

Cynophállus (Fr.) Cda.

This genus, though considerably smaller, resembles the former two in general shape. Its cap, however, is not free from the stem, and is of the same dimension, although tapering towards the apex and of red colour. It is covered with the mucilaginous, green gleba. Veil absent. Volva present. Growing on the ground in woods.

GEASTER HYGROMETRICUS

Cynophállus canínus (Huds.) Fr.

PINK-CAPPED STINKHORN

(Pl. 109[2])

NOT EDIBLE

STEM: 2 to 3 inches long, ¼ to ½ inch thick; hollow, cylindrical, honeycombed, tapering to the cap; apex closed or open, pointed; covered with the slimy, olive-green gleba. The colour of the pileus beneath the gleba is bright-pink to red, the stem is pink to flesh colour. The VOLVA is white; edges lacerated, loosely adhering to the base of the stem.

It is found in woods during July and August.

For the sake of simplicity and ready popular distinction we have divided the group of Gasteromycetes dealt with, into plants with stem-like receptacles and plants wherein no definite, elongated stem exists. This latter group includes the forms popularly referred to as "puffballs," as well as the so-called "bird-nest fungi," which are common objects of interest because of their curious structure.

(*a*) Receptacles entire, opening at maturity with round hole at apex

(Plants star-shaped)

Genus 3

Geáster (Micheli) Fr.

The young plant is globose to bulb-shaped, often with a tip at the centre, usually brown to reddish-brown. It consists of an outer, thickish wall composed of two or three layers, enclosing within the spore-containing fruiting body, which is covered by a thin membrane, opening later at the apex with a more or less round hole.

At maturity the outer wall commences splitting at the tip into fairly regular segments, generally from three to more, revealing the globular fruiting body. These segments open up in a star-like fashion, and since the plants occur on the ground, the name "Earth Star" has been given to them.

GEASTER TRIPLEX

Fig. 1. Young plant with mycelium. 2. Section of same.
Remainder of figures illustrate further development.

Geáster hygrométricus Pers.

BAROMETER EARTH STAR

(Pl. 111)

EDIBLE

In this species the outer wall consists of three layers. Since there are other structural differences, some authors considered it necessary to establish for it the genus *Astraeus*. The unexpanded plant is globose, without an apical tip; ¾ to 1 inch in size; dirty-grey to greyish-brown. The outer wall breaks into many segments, often fifteen and more. The segments extend to below the fruiting body, which is covered with a thin, brownish membrane, opening on maturity with a hole at the apex. Much confusion existed in recognizing the three layers composing the outer wall, inasmuch as the middle layer remained connected with the extreme outer one, and merely cracks into numerous areas. The third layer, i.e., the innermost, alone peels off the middle layer. In dry weather the segments roll inward and expand in a star-like manner when wet, hence its popular designation.

Superficially on the ground on sandy soil in open woods, from July to August.

Geáster tríplex Jungh.

COLLAR EARTH STAR

(Pl. 112)

EDIBLE

The brown to reddish-brown, bulb-like plant is stemless, at first half buried, later superficial on the ground; globose, with the apex terminating acutely; 1 to 1½ inch in size; the thick, fleshy, outer wall splitting from the apex into very uniform segments; pale dirty brown within; disclosing the globular fruiting body. The segments open out flat, and in doing so we observe the two layers composing it, viz. the inner more fleshy and the outer more fibrous. The fleshy layer cracks into halves at the base of each segment and remains like a cup-shaped collar around the fruiting body. The rest of the segment breaks up into areas. Eventually the characteristic star shape results. The fruiting body is covered with a thin, papery membrane, and on maturity discharges clouds of spores through a fringed, round opening at the apex when slightly pressed.

Common from July to September, singly or scattered on ground in open woods. Edible when young.

(Plants not star-shaped)

Genus 4

Lycopérdon (Tournef.) Pers.

Plants from beginning to maturity globular, pear, top, or flask-shaped, opening at the apex with a distinct mouth. At first the interior is quite solid and white, gradually, as the spores are formed, becoming tinged ochre, and drying up when they are fully mature. The spores are dis-

LYCOPERDON GEMMATUM

charged at the slightest touch in dense, coloured clouds through the apical mouth. The exterior surface is either smooth or covered with symmetrically arranged, tufted warts or scales, or fine granules easily rubbed off. Growing on ground in open spaces or on stumps and logs. All species are edible so long as they are pure-white inside.

Lycopérdon gemmátum Batsch.
GEMMED PUFFBALL
(Pl. 113)
EDIBLE

The shape of a solitary plant resembles a top, 1 to 2 inches high by 1 to 1½ inches wide; often very irregular owing to crowding of many specimens together; at the apex faintly umbonate or slightly depressed, with a round hole in the centre. The base is finely granulate and lighter in colour than the top, which is pure-white at first, changing to buff and tan with a deeper tint towards the apex. The surface is covered with long and short, scaly tufts, easily disappearing as the plants mature but leaving a net-like marking behind. On sectioning the plant one will find that only a portion of the interior produces spores, while the rest at the base remains sterile.

Very common and widely distributed. Growing on wood or on ground, from August to October.

Lycopérdon pýriforme (Schaeff.) Pers.
PEAR-SHAPED PUFFBALL
(Pl. 114)
EDIBLE

Plants arising from prominent, spawn-like strands; at first white, globular, and more pronouncedly scaly, later pear-shaped, bluntly tapering towards the base; from 1 to 2 inches high; tan to brownish; apex perforated with a small, torn hole. In older plants the surface is minutely scaly, becoming reticulated as the scales disappear, finally drying up and becoming papery. Base sterile—well shown in our plate.

This is a common puffball and world wide. It grows on decayed logs, stumps, and woody refuse, generally in dense clusters, from July to October.

Lycopérdon Wríghtii B. et C.
WRIGHT'S PUFFBALL
(Pl. 115[2])
EDIBLE

Plants pure white; ½ to 1½ inches in diameter, ¾ to 1 inch high; globose, frequently slightly flattened, sessile; surface densely covered with pyramidal white warts or spines, easily rubbed off, leaving a smooth, often velvety surface.

Very common, growing in pastures and grassy places in dense clusters, from July to October.

LYCOPERDON PYRIFORME

being described. They grow either singly or scattered, or occur in densely crowded clumps, usually prominent when fully grown, when their characteristic shapes form conspicuous objects. At first they are globose with a round hole at the apex, but later they expand and form cups, goblets, or flat, wavy disks. The inner or upper surface is covered with the fruiting layer, often velvety, dull or brightly coloured; outside they may be smooth or finely to felty woolly. The plants are either sessile or have a root-like, tapering, short base or a more or less long, partly embedded stem. None are used for the table to our knowledge. Growing on ground, decaying limbs, or wood.

Genus 4

Plicária Fuckel.

Singly or a few growing together; sessile; at first globose and nearly closed, later opening into flat, disk-like or shallow cups, with incurved or wavy, lacerated margin; outside smooth; rarely with a very short, stem-like taper at the base.

Plicária bádia Pers.

BAY-COLOURED PLICARIA

(Pl. 125[1])

When expanded, 1 to 2 inches across; usually disk-like, with either incurved or inrolled entire margin; velvety and dark olive-green inside, outside minutely granular and dark-umber. Flesh thin, brittle.

Singly or one or more in a group, on ground along wood roads or among grass, June to October. Also known as *Peziza badia* Pers.

Plicária repánda Wahlb.

REPAND PLICARIA

(Pl. 125[2])

As the name suggests, this rather conspicuous form appears as if the margins of an otherwise fairly regular, flat disk are bent backwards. Often from 1 to 4 inches across; thin and brittle. Margin wavy; dark velvety-brown inside or on top, and whitish below. At first globose, closed, later flat and closely lying on the ground.

Common during wet weather in early summer on ground or decaying wood. Frequently in greenhouses. Often referred to as *Peziza repanda* Wahlb.

Genus 5

Pustulária Fuckel.

Plants larger than in *Plicaria*, and more often in large clumps of many specimens. They are half buried, and sessile, at first globose and closed, when fully expanded bell to cup-shaped with torn, irregular margins, often with a root-like taper at the base. Outside smooth to floccose.

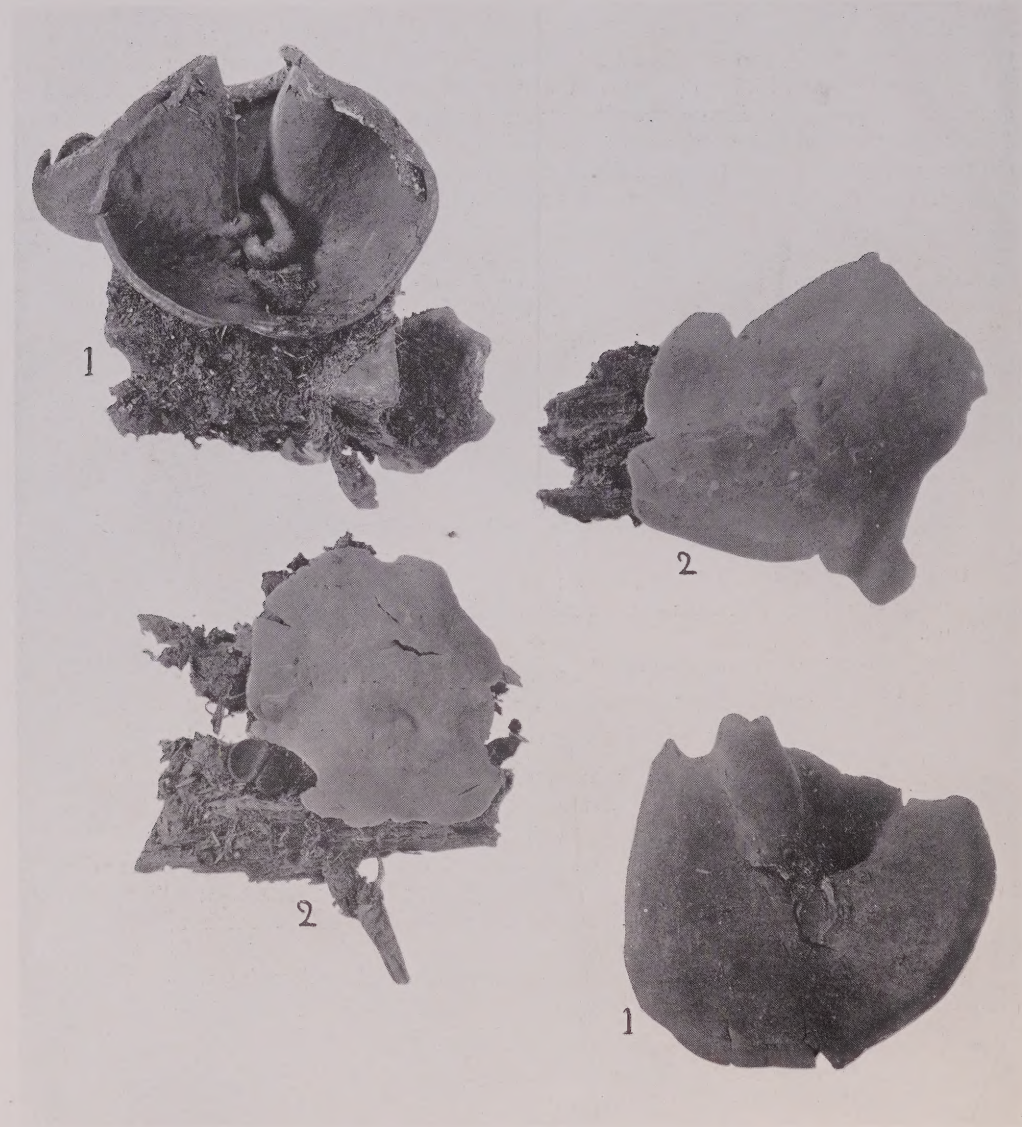


Fig. 1. PLICARIA BADIA
Fig 2. PLICARIA REPANDA

Fig. 1. PUSTULARIA VESICULOSA
Fig. 2. SARCOSCYPHA COCCINEA

23837—16½

Pustulária vesiculósa Bull.
WAXY PUSTULARIA
(Pl. 126[1])

Generally in crowded clumps, rarely solitary to more in a group. At first globose, opening with a small hole at apex, when fully expanded forming deep, more or less ventricose cups, often irregular in shape from crowding; 1 to 2 inches wide and of the same height. Sessile and half imbedded in ground, with a short, stubby stem. Waxy to watersoaked, light-brown to dirty-ochre, fragile, smooth inside, outside greyish-white, floccose. Margin wavy, often incurved. Growing on piled refuse or old manure in dense clusters, May to July. *Peziza cerea* Sow., is either synonymous with or a variety of above.

Genus 6 **Sarcoscýpha** Fr.

Singly or in clumps. At first closed, later bell- to cup-shaped, with a more or less long stem half-buried in ground, outside felty to woolly. Some species conspicuously coloured.

Sarcoscýpha coccínea Jacq.
CRIMSON SARCOSCYPHA
(Pl. 126[2])

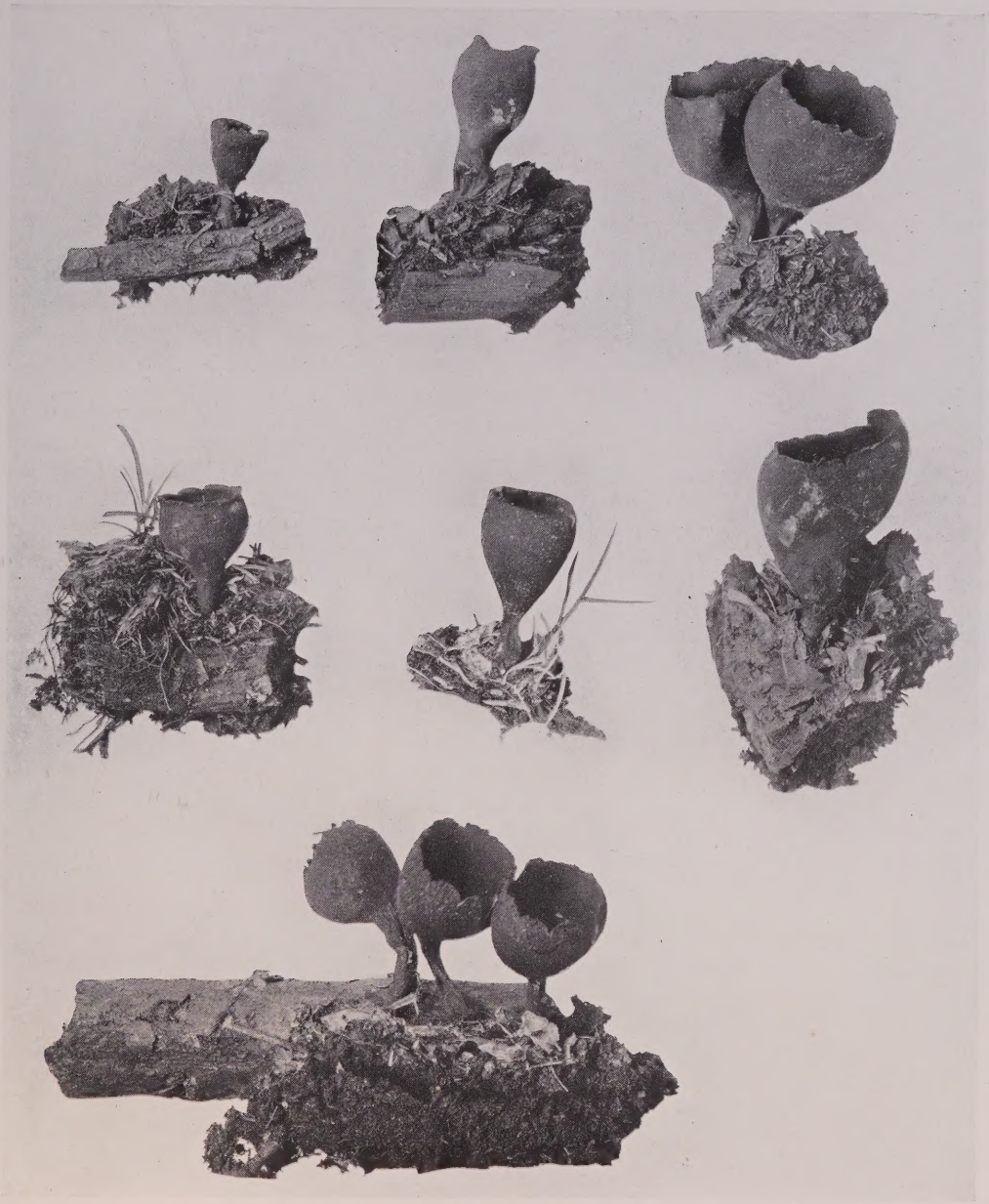
Easily recognized by its bright-crimson colour when fully expanded. At first globose and closed, from the beginning externally covered with fine, long, dense, woolly hairs. Expanding into irregular cups with finely fringed margin. Inside velvety crimson, outside hairy whitish. Stem short. On ground on decayed limbs or roots, usually several together. It is one of the earliest fungi that appear in spring, and lasts well up into July. *Peziza coccinea* Jacq. is now an obsolete name.

Genus 7 **Geopýxis** Pers.

Usually in less crowded clumps. At first closed, later cup- to goblet-shape, with a prominent short to long and thin stem. Outside smooth or finely downy.

Geopýxis Cratérium Schwein.
BLACK GOBLET
(Pl. 127)

Easily recognized by its long-stemmed, goblet shape and black colour. At first closed, later expanding into its characteristic shape. From 1 to 2 inches high by 1 to 1½ inches broad. Inside of cup dark blackish-umber, outside muddy-black, scaly. The margin is generally lacerated and irregular. Flesh thin, rather corky. Growing on decaying limbs at the edge of thin woods, from May to June. Formerly known as *Urnula Craterium* Fr.



GEOPYXIS CRATERIUM

CHAPTER VI

FUNGI AS FOOD

It is fairly safe to say that most fatalities, if not all, resulting from the eating of poisonous fungi, have been due to lack of knowledge or almost criminal carelessness on the part of an unfortunate or misinformed collector. For with knowledge and care, fatalities due to the eating of poisonous kinds may be wholly avoided. Our first recommendation, therefore, would be: Eat no fungus of any kind unknown to you. Assume not the slightest risk, and make sure that all specimens collected are safe to eat.

It is a thorough knowledge only, that constitutes the greatest measure of safety. At present this knowledge is fundamentally lacking; and it is something of a surprise that fatalities are not more frequent. We have on occasions observed people collecting all kinds of fungi, who assured us they were all safe to eat, and yet had no knowledge by which to identify any of them. In consequence of lack of knowledge, there are spoiling every year in Canada, many hundreds of varieties of edible fungi, that might form a most welcome change in one's diet. We would further suggest that all mixtures of fungi—the result of haphazard collection—should be avoided. Too often a poisonous kind might be found in such collections. Avoid all old and watersoaked and unsound specimens. Soft, fleshy fungi spoil very quickly, others become rapidly infested with maggots, and a few hours may suffice to render them unwholesome for food, even though perfectly good in their fresh condition. When collecting fungi for the table, unless you know them at once from appearance, dig out the whole plant. Many times serious consequences will be avoided if one has an entire plant for study and determination.

In our introduction we stated that all so-called tests are myths and foolish nonsense. The popular claim that a silver spoon or coin dipped into a dish of cooked fungi will turn black if it contains poisonous ones, is entirely without foundation. "The mushroom will peel" is another belief. Poisonous fungi may "peel" as readily. Offensive odour, bitter taste, milky juices when cutting into a fresh specimen, livid colours or colour changes of bruised fungi—not one of these claims may be considered as of the slightest value in distinguishing a poisonous from an edible form. Any spoiled fungus, even of the most valuable kind as food, will give off an offensive odour. In this connection odour may well be considered a factor of some importance, but the odour of fresh fungi is no criterion of safety or otherwise.

For the beginner we have prepared a list including some that are most easily recognized with little difficulty, either by shape or structure, and that are as safe to eat as they are delicious when properly prepared, viz. the Common Mushroom, Morel, Shaggy Mane, Common Ink Cap, Glistening Ink Cap, Oyster Mushroom, Parasol Mushroom, Honey Agaric, Velvet-Stemmed Collybia, all coral fungi and all puffballs, providing the latter are pure white when cut through.

In regard to the food value of fungi, this is a much debated question. On the continent of Europe and in the Far East, surprisingly large quantities of all kinds of fungi are consumed and

may be found offered for sale on public markets. In some countries the market authorities issue special regulations governing their sale, and prescribing the kinds permitted to be sold on the open markets. It may thus be easily understood why in some countries fungi have come to be regarded as rather important articles of food; chiefly because of the large quantities consumed, thus producing easily a feeling of satiety, or because of the fact that some of them resemble meat and other animal substances in flavour and taste, rather than because of their actual food value.

No fungus will ever form a substitute for meat of any kind, although they may be prepared by the addition of actual food substances and thus not only become more palatable, but contain considerable food value. This however, should not be confused with the intrinsic food value of fungi, which, as will be seen later, is only somewhat higher than that of cooked vegetables.

The question of taste is quite another matter. Providing fungi are carefully prepared, they indeed may form a most enjoyable and tasty repast. They are most valuable as savouries, flavours, and condiments. Generally speaking, all substances consumed for the nourishment of the body may be regarded as food. Chemical analysis has divided food substances into two fundamental groups, viz. nitrogenous (proteins and nitrogenous extracts), and non-nitrogenous (carbohydrates, fats, etc., etc.). Raw beef contains about 20 per cent nitrogenous substances; fresh vegetables about 3 to 4 per cent; fresh table mushrooms from 7 to 8 per cent, the chanterelle about 3 to 4 per cent, the oyster fungus 3 to 4 per cent, the morel about 7 to 8 per cent, and so on. Of non-nitrogenous substances there exist in fungi about 4 per cent, in vegetables about 3 per cent, while in meat there are practically none. Fungi are composed of a high percentage of water—93 to 95 per cent as compared to lean beef with 70 per cent and fresh vegetables with about 92 per cent. Fungi also contain small amounts of nutritive salts and sugar. Further researches may reveal the presence of useful vitamines; should this be the case the potential value of fungi as a food may be still more enhanced.

In consequence, fungi should never be regarded as of high nutritive value, nor as a staple food. They are of slightly more value apparently than turnips, carrots, cabbage, and other similar vegetables.

CHAPTER VII

SUGGESTIONS FOR THE PREPARATION OF FUNGI FOR THE TABLE

On page 246 we have recommended a number of fungi for beginners, and once more we advise our readers to confine themselves at the start to these, until they have established a better acquaintance with other edible forms. It is better to be safe than sorry.

In preparing fungi for the table, exercise the same care as you would when selecting other food materials. Let all fungi, especially, be fresh, and do not use them at all if ever so slightly touched by decay. Avoid old, maggoty, and water-soaked specimens.

With these few precautions we now take the liberty of suggesting a few simple methods for their preparation for the table. The following preliminaries may be appreciated:—

When collecting fungi for the table you may save yourself endless trouble by the exercise of care. Nothing is more unpleasant than a meal of "sandy" fungi; hence, be careful to collect them as free from sand and earth as possible. Morels are the most serious "offenders" in this regard, and require careful and thorough washing if dirty. Clean all fungi with a damp cloth or by gently scraping them and by removing the gills only when they have turned black, as in the common mushroom or in the inky caps, otherwise the dish looks rather unappetizing. If possible avoid washing them. When they require this they will absorb much moisture, and this must be got rid of either by gentle pressure or draining, or by evaporating it when cooking them, and the latter procedure is "hard on butter." Fungi do not all require to be peeled; though some of them may be better for it. If the stems are fleshy and soft they may be used. Tough stems remain tough even if cooked for a long time. Depending upon the size of the specimens they may either be used whole when small or be cut into small pieces, of uniform thickness preferably, or they will not cook evenly.

Most fungi served at the table are salty beyond enjoyment. This is due to the fact that salt is often added before the fungi are cooked, when, in their raw condition, they appear a much greater quantity than they will turn out to be when cooked. Hence, use salt, and pepper as well, with care. Remember to salt for half, and even less, the quantity you have prepared for cooking. Remember further that long cooking does not make them more tender, for the same reason that eggs become harder and harder when boiled too long. The albumen of the fungi is responsible for this in a large measure. It is advisable, in order to avoid a dish of fungi becoming tough, to add half a teaspoonful of baking soda to about two pints of cut and sliced fungi.

Unless otherwise stated, the term "mushroom" is used collectively in the suggested recipes, including all edible kinds of fungi.

MUSHROOMS FRIED IN BUTTER ON TOAST

One of the most palatable dishes may be made of any and all fungi of an edible nature by the use of plenty of fresh and good butter.

Place a frying pan containing butter on the fire and allow the butter to just turn brown, then add the whole, sliced, or cut up fungi and cover with a lid. Stew slowly for about ten minutes, or longer if the quantity is large. By this time the fungi should be sufficiently cooked, when the lid should be removed. Attention is now necessary, as the superfluous water (fungi contain 90 per cent and more) is evaporated. Butter should be added in just sufficient quantity to keep from burning and not to make the dish too greasy.

Meanwhile get buttered toast ready, have plates quite hot, dish fungi from the pan to the toast, and serve at the table as hot as possible.

NOTE.—No salt or pepper has been added. Butter usually contains the required amount of salt, and either or both seasonings may be added any time, according to taste.

FRIED MUSHROOMS AND EGGS

Fry the fungi in the manner above described. Just before they are ready to be served, break one or more eggs into the clear centre of the pan, season, and cover with lid until white of egg is set.

FRIED MUSHROOMS AND SCRAMBLED EGGS

Fry the fungi as described. Meanwhile prepare, as usual, eggs for scrambling. Then add the fried mushrooms to the eggs and scramble them in a buttered pan in the usual manner.

MUSHROOM OMELET

Fry the fungi as described. Prepare batter for omelets in the usual manner, and when made, fill with mushrooms.

MUSHROOM SWEETBREADS

Mushrooms fried in the above manner, when served with daintily prepared sweetbreads, constitute a most palatable and appetizing, as well as nutritious food.

STEWED MUSHROOMS

Any fungus of an edible nature may be used. Cut them up into small pieces and place them in the frying pan with a small amount of butter. Stew well, under lid, for ten minutes or more. Meanwhile beat a little flour in water or cold broth, add finely chopped parsley, salt to taste, and pour over mushrooms in pan. Bring to the boil for a few minutes, scramble, and serve on toast or as a vegetable.

Instead of using butter alone, peanut butter may be added, which gives a pleasant flavour to the fungi. Instead of water and flour, use milk for a change, or milk and egg beaten together. The addition of parsley enhances the flavour.

MUSHROOM RAREBIT

This dish is best prepared in individual containers, which will stand baking-heat. Prepare in the usual manner all ingredients necessary for Welsh rarebit. Butter each container, add several spoonfuls of fungi, fried according to our pan method, add the rarebit and bake in oven in the usual manner.

BREADED MUSHROOMS

Puffballs cut into slices, field and common mushrooms used whole, are buttered, seasoned with salt and pepper, and rolled in egg and breadcrumbs. Afterwards fry them briskly in butter the same as egg-plants.

MUSHROOM SOUP

Mince the fungi finely. Add to hot broth and boil for twenty minutes. Brown some flour in butter, beat slowly into the soup, add salt and pepper and chopped parsley according to taste. Strain or serve unstrained.

SCALLOPED MUSHROOMS

Fry in butter as described. Cut potatoes into thin slices. Use buttered individual or larger dishes. Place one layer of potatoes on the bottom of dish and season, then add a layer of fungi and alternately potatoes, until dish is filled. Then pour over the whole one or two eggs beaten in milk or broth, and bake in hot oven.

These suggestions have all been tried out and have proved acceptable to many of our friends. The skilful housewife may find many ways of improving these recipes, and the devising of new and original methods for the preparation of fungi should prove most interesting.

In conclusion we may point out that when a larger quantity of fungi has been brought in than is necessary for immediate consumption, they may be dried or evaporated. This is easily accomplished with suitable forms, such as morels, common mushrooms, chanterelles, etc., by cutting them up into thin slices or bits and by drying them on cheesecloth-covered frames in the sun. When dry they should be kept in cheesecloth bags, and for use they should be steeped in a little water over night. They are very useful at seasons when fresh fungi are not available, as additions to soups, gravies, or they may be fried and used as fresh material.

CHAPTER VIII

POISONING BY FUNGI

The distrust and dread which most people entertain towards the eating of fungi is without doubt due to fear of committing an error that may prove fatal. This fear is due, we repeat, most frequently to lack of knowledge; and it is hoped that this account may serve to educate people to a different and more correct frame of mind towards fungi. The subject might with advantage be introduced into the curricula of our schools, since a knowledge of the means of distinguishing the poisonous from the edible fungi is just as important as a knowledge of poisonous plants generally. There exist several treatises on poisonous plants occurring in Canada, but so far no exhaustive one is available on poisonous fungi.

We shall always be pleased to answer any inquiries in regard to fungi, and would indeed appreciate contributions from any locality of Canada in order to complete our knowledge of the kind and frequency of these plants in other districts.

To the members of the medical profession we desire especially to extend a cordial invitation to communicate to us any cases of poisoning due to fungi (incidentally any poisonous plant) that may have come under their observation. The history of each case, the cause, which in the interest of all should be traced wherever possible, together with symptoms and therapeutic measures employed, would be most welcome. All such accounts will be carefully preserved; and it is hoped the material may be made available some day for publication for the good of all. At present such records are extremely meagre in the medical literature of this country.

Aside from the ptomaine-like poisoning likely to follow the eating of fungi that have been kept until spoiled—which they will do very quickly—there are records of cases of acute indigestion resulting from too large a meal, and lastly, of the peculiar and violent reactions of some persons after partaking of even the common wild or cultivated mushroom. This is a condition of idiosyncrasy similar to that of people who show symptoms of poisoning after eating shell-fish or strawberries. Naturally, experience will soon reveal whether a person had better avoid fungi altogether. Similarly, it may be said that some fungi are harmless to some people, or better at certain times or seasons of the year, or in some countries and not in others. A case in point in this regard is afforded by the fungus *Gyromytra esculenta* (vide page 235). Although the second name particularly indicates its edibility, yet not long ago a fatal case from eating this species was recorded, and, moreover, on investigation proved to be well-founded. Both authors have eaten this fungus on frequent occasions, one of us the European form, the other the form found in Canada, and we live to tell the story; but since this last case we feel inclined to suggest that this species should only be eaten when quite fresh and in perfect condition. European literature also records cases of poisoning from this cause, and the suggestion is made that this may have been due to the use of spoiled specimens.

Deaths from the eating of some of the most deadly fungi known in Canada, unfortunately have occurred on several occasions. All cases that we have been able to investigate of such fatal termination were due to most regrettable error and deplorable ignorance of fungi generally, on

the part of the collector; who is to blame for what may happen not only to himself, but to others also, who may unsuspectingly partake of the fatal meal set before them. This is indeed a serious responsibility; and it is far wiser to abstain from eating any fungi unless they have been passed as safe by "one who really knows." Of the many common fungi mentioned in this treatise, only two deadly poisonous ones are referred to. These should be so thoroughly known that a fatal mistake becomes practically an impossibility. Both are found often in large numbers by themselves; but it is the single specimen growing among harmless ones that often causes trouble. For the present we would suggest that beginners learn to recognize above all these two poisonous kinds, and confine themselves to the fungi on the list suggested for them (on page 246), when they will be perfectly safe. As their knowledge increases others may be added to the list, until gradually all the fungi in this bulletin have become familiar to them; and the great variety mentioned should suffice their culinary requirements.

Most cases of poisoning in Canada are due to *Amanita muscaria* and *A. phalloides*, the Fly Agaric and the Death Angel respectively, both of which have been described in detail in the pages of this bulletin. They are the only ones illustrated in colours, which, together with a detailed description and other good photographs from living specimens, should obviate any difficulty in determining them.

A very lamentable tragedy from poisoning by the Death Angel occurred not long ago in the city of Toronto, causing the death of one, and the serious illness of others members of a family. About a pint of mushrooms was collected from a limited area a few yards square, and eaten the same evening. During the night ill effects became apparent, and preventive measures were taken by some of the family. In the morning all who had partaken of the mushrooms were ill, and a physician was called in. The daughter appeared most seriously affected, and in spite of all his efforts, died after a short illness, the other members of the family recovering. We are indebted to Dr. Frank Abbott of Toronto, the attending physician, for his record of the case, which is as follows:—

"The mushrooms were eaten about eleven o'clock Sunday evening, August 24, and in the case that ended fatally, nausea and vomiting showed sometime before seven the following morning, but with the others not until 8 a.m. Vomiting from the first was frequent and severe, soon bilious in character, and each bout preceded cramp-like epigastric pain. Diarrhœa showed almost as soon as the vomiting, and for three or four days the fluid passed was dark green. Thirst and a sense of weakness developed, and in one case headache. The pulse was usually around 76 and temperature at or a little below normal. In the case that terminated fatally, the first danger sign was a speeding and weakening of the pulse, which showed three days after onset of illness. The weakness increased, then delirium, coma, and death three and a half days after onset of first symptoms of mushroom poisoning.

"The early treatment was mainly frequent giving of hot water by mouth, which was promptly expelled, as also calomel given as a purge, and large, hot, saline enemata. Atropin was given hypodermically at first, in 1/100 gr. doses, and later atropin 1/150 gr. with morphin sulph. grs. 1/6 to relieve pain. Bismuth and tinct. opium was tried by mouth, but was not retained, nor at first was brandy, given in frequent and small doses. Heat was used to stomach, and patients confined strictly to bed. In the fatal case, unavailing efforts were made to combat the cardiac poisoning by strychnia and digitalin hypodermically, and large saline injections under the breasts."

While engaged in preparing the manuscript of this treatise there has reached us a very detailed account of a sad fatality that occurred in London, Ont., as recently as September, 1926. We are indebted to Dr. John Dearness, of London, Ont., the veteran Canadian mycologist, for the following account:—

"In the early forenoon of Saturday, September 11, 1926, M., a day labourer, aged fifty-five, collected in a thin woodland near London, Ont., three or four quarts of mixed white mushrooms. They were cleaned and stewed in milk with choppe d parsley and onions. The parents with two children, John, aged twelve, and Annie, aged seven, had dinner about eleven o'clock and ate a portion of the mushroom stew.

"In the mid-afternoon a Polish acquaintance, Stan. S., aged forty-five, called at M.'s home. He learned of the mushroom delicacy they had had for dinner, regretting that he had not gone mushroom-collecting with M., and was pleased when he was given a bowl of the stew, which he took away to the home of Joseph S. Between three and four o'clock these two men sat down to enjoy the treat. Jos. S. sampled two or three spoonfuls, declared they were bitter and that he did not like them and stopped with that. Stan. S. said they were good, that he liked them, and finished his dish. The former assured me himself that he did not swallow more than a good teaspoonful. By 5.00 p.m. Mrs. M. began to feel pain in the region of the stomach, and nausea, succeeded by dizziness and a feeling she described 'as if I were drunk.' Thereupon she dosed herself heavily with castor oil. Shortly afterwards her husband came into the house feeling 'queer.' Then Stan. S. called to thank them for the mushrooms, and finding two of them ill assured them that it couldn't be the fault of the mushrooms seeing that he was feeling fine. In the late evening the twelve-year-old boy alarmed the neighbours with the story that his father and mother were dying. By nine o'clock the two children as well as the parents were very ill. Medical aid arrived. Cramps, particularly in the legs, vomiting, diarrhoea, and other evidences indicated amanitine poisoning to the physicians, and they did the best in the case that medical science knows. The family, including a nursing infant, were removed to the hospital. After the lapse of a like number of hours Stan. S. became similarly ill and was taken to the hospital. Jos. S.'s turn came next, but he remained in his home and was nursed by his family.

"The hospital records show, of course, the progress of the poisoning in each case, and the remedial measures and medicaments employed to meet the varying conditions as they developed. Taken altogether they exhibit variation and repetition of the following effects: cramping pains more or less violent, often in the limbs; vomiting, sometimes of greenish liquids; diarrhoea, greenish liquid stools, passing of blood; fierce thirst; local or general severe soreness of the muscles; very rapid, weak, thready pulsation; bluish or greenish jaundice; alternation of drowsiness and delirium; rigidity of the limbs; brief coma. In the tale of medication employed, when and as needed, were stomach-washing, colon-flushing, morphia, spiritus frumenti, atropin, digitalis, hyoscine, adrenalin.

"Annie M., the seven-year-old child, was the first to be relieved by death. In twenty-two hours from the eating of the mushrooms her eyes were becoming starey, her extremities rigid, and her throat unable to swallow. Before the twenty-fourth hour had elapsed her consciousness ceased; adrenalin failed to whip up the heart to further action. She was dead.

"The father, a man of rugged, muscular frame, was next to go. On Monday morning, in his delirium, he got out of bed and as late as four o'clock in the afternoon he was struggling to rise. At 4.20, in the forty-first hour after the fatal meal, he had ceased to breathe.

"Stan. S., an able-bodied and younger man than M., whose mushrooms were eaten four or five hours later, survived him by twelve hours, being a period of two days and fourteen hours from the time he supped the dish. He was delirious and talking wildly when his eyes began to glaze, his limbs stiffened, his face became gray, and his pulse stopped.

Jos. S., who stated to me that he hardly more than well tasted the stew, kept his bed at his home for five days. His acute attacks would seem from the accounts I obtained to have been quite severe, but yet less violent and less frequent than those already referred to. On the fifth day, he had one or two of these attacks, but at four o'clock in the afternoon his family thought he was past the crisis and were hopeful of his recovery. And yet, in less than two hours, with his physician at his bedside fighting for his life, his heart failed.

"John M., the boy, suffered experiences similar to those of the others. At eight a.m. on the fourth day he stiffened out, and with head thrown backwards, and eyes starey, he mumbled deliriously through an attack that lasted about five minutes. Revived by stimulants, he vomited some greenish fluid and from that time began to improve without serious relapse. He left the hospital on the twenty-fifth day, still paralyzed in his legs. With the help of crutches he began to use his legs, gradually recovered their tone, and now at the end of two and a half months is nearly well.

"The infant that fed at the breast of the poisoned mother on the first half day, showed no toxic effects.

"The mother herself, who thinks she ate as much of the stew as any of the others, suffered terrible pains in all her muscles and passed considerable blood, but she seemed to escape the intense severity of the onsets endured by those who died. She may have responded more favourably to the medication, or the heavy dosing with castor-oil and the early vomiting may have had beneficial effects. She and her son left the hospital the same day. Now in the eleventh week she can still feel the effects of the poisoning in the muscles of her arms and calves.

"The title of this report names the genus of the offending fungus; I may fairly safely go a step further and name the species. Part of the stew had been set aside in the M's home to be served at a future meal. This, or a portion of it was brought to me, and by floating it and gently washing it out in large quantities of water, the parts became more or less recognizable and, after dissolving the fatty globules out in alcohol and ether, suitable for microscopical examination. There was evidence from spores and tissues of at least five different kinds; infundibulate Clitocybes, short-celled Lactars or Russulae, and Amanitae. There were two unbroken caps with annulus and most of the stem of *Amanita verna* [*A. phalloides* var. *verna*]. There were several stems and portions of caps having appearance and microscopic tissues quite like those of the specimens last named. I judged that approximately twenty to twenty-five per cent of the collection may have been of *Amanita verna*."

In reviewing a surprisingly large number of cases of poisoning due to this species, reported in detail by Dr. Ludwig Welsmann of Westphalia, Germany,[1] it would appear from his observations that in cases poisoned by *A. phalloides*, there should be distinguished,—

1. Poisoning accompanied by paralysis of the vasomotor centre.

2. Without this type of paralysis.

Where paralysis occurs, the pulse becomes weak, frequent, threadlike, and later on cannot be felt. The most severe cases show no discernible pulse a few hours after the first symptoms. In others the pulse may remain normal in the beginning, but declines suddenly without any apparent cause. Nearly all such cases terminate fatally from the second to the sixth day after the eating of the poisonous species.

Cases of the second group, with symptoms otherwise similar to those above, usually recover.

Typical in cases of *Amanita phalloides* poisoning is the long period of incubation (from 7 to 40 hours) before the first symptoms appear. In *A. muscaria* these may occur 3 to 4 hours after ingestion. Only on rare occasions are such early symptoms due to *A. phalloides*, and if so they are generally exceedingly grave in their consequences. Violent vomiting and diarrhoea exist in all cases, and patients complain about severe pain in the region of the stomach, and severe lassitude. Pulse and heart are normal in the beginning; later, generally with surprising suddenness, pulse increase to 120 and more. The temperature remains normal; only on rare occasions subnormal. In a very severe case a pre-mortal temperature of 100.4 F. has been recorded. Convulsions did not occur in a single case. Death results from increasing weakness of the heart, with rising pulse frequence. In some cases death resulted from the eating of a single forkful. Constitution, age, and sex play no role. Mortality occurs in 60 to 80 cases out of 100, though these figures have only relative value. Dr. Welsmann describes the clinical history of an authentic case of *A. phalloides* poisoning as follows:—

"Female, 21 years of age. Twelve hours after eating several spoonfuls of *A. phalloides*, vomiting, diarrhœa. Pulse 80, strong. Pain in the region of the liver. Liver not enlarged. Second day: Heart beat, clear, low; pulse 128, thin. Edge of liver extended beyond ribs about the width of two fingers, left lobe of liver exceedingly sensitive to pressure. Spleen not palpable. Urin: Albumen + (Esbach 2°/oo); Sugar −; Sediment: numerous epithelia. Urobilin −; Urobilinogen −; Indican −; Diazo —; Blood −.

"Blood examination: red corpuscles 3,100,000; white 8,600; Hæmoglobin (Tallquist) 60 per cent; Polymorph. Leucocytes 79 per cent; Lymphocytes 16 per cent; Monocytes 4 per cent; Eosinophile 1 per cent.

"Nerve system: Pupils both sides equally wide. Prompt response to light and accommodation. Abdominal reflexes present; both patellar reflexes and left Achilles tendon reflex absent. Babinski, positive right. No disturbances of sensibility.

"Treatment: Stomach and intestinal lavage. Repeated camphor and strychnine injections. In the course of a day three intravenal 20 per cent infusions of glucose, 250 cc. After the first—passing improvement of pulse; no improvement of heart action after the others. Temperature 98·2. Sensorium free. Patient's pulse absent. Death 57 hours after beginning of symptoms."

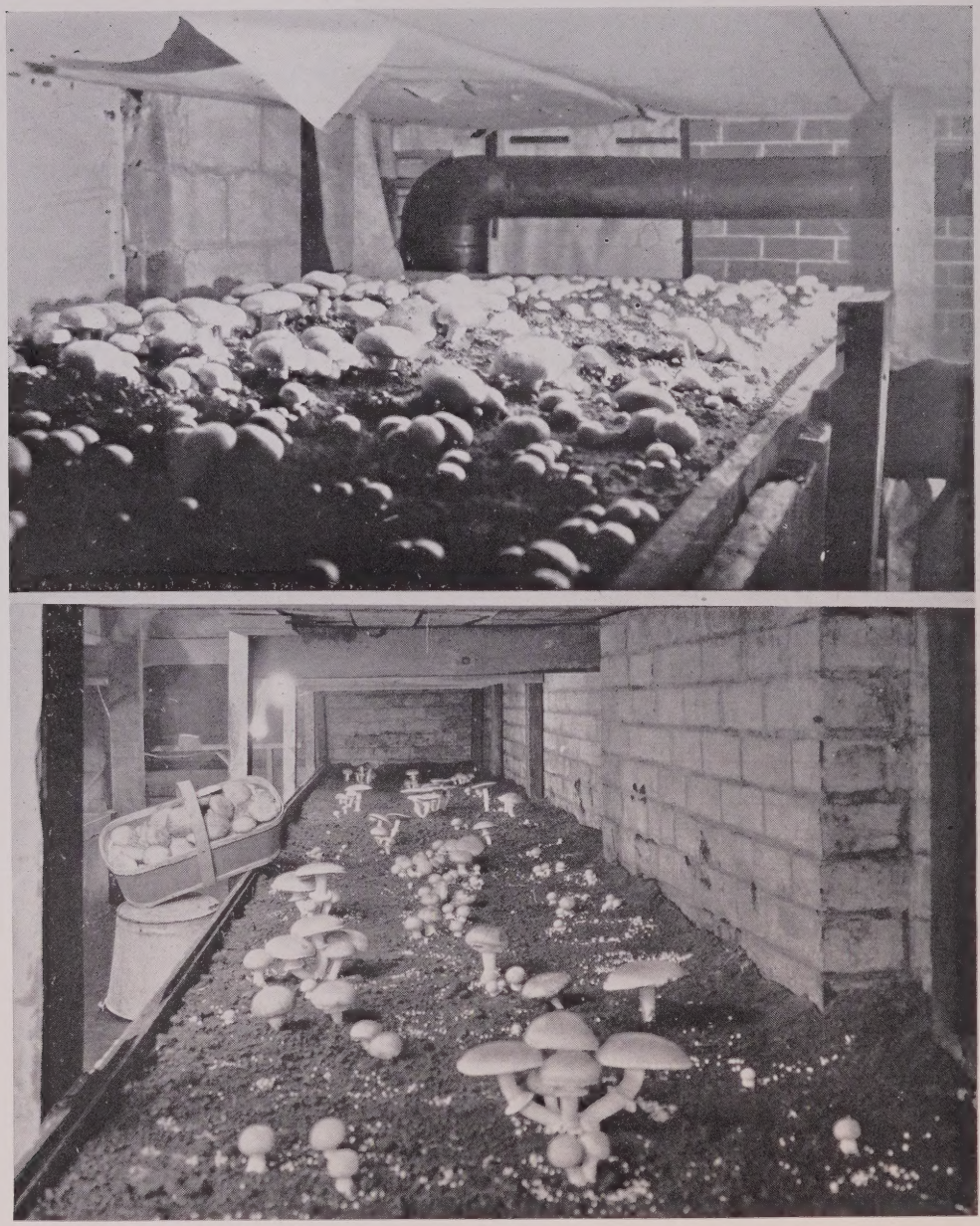
It is hoped that this detailed account may serve as a basis for clinical observations on the part of interested Canadian physicians, and enable us to fully ascertain the physiological reaction due to fungus toxins of the various types. At any rate, should trouble occur after eating of fungi, do not fail to consult as quickly as possible, a competent physician, who should be informed

[1] Welsmann, Dr. Ludwig: Vergiftung mit Amanita phalloides Fr. Deutsches Archiv für klinische Medizin 145. Bd. H. 3/4. p. 151-160. 1924.—Medizinische Klinik Jahrgang 1921. No. 26.

of the suspected cause of the trouble without delay and without exception. This is the most important of all precautions. Before the arrival of the physician the following first-aid measures are recommended:—

Foremost of all, stomach and intestines should be emptied as promptly as possible. Vomiting should be induced without delay. A tablespoonful of mustard powder in a pint or more of hot water might produce the desired effect, when a patient cannot induce vomiting through tickling of the throat as deep down as possible. Some people are extraordinarily successful in using their finger, inserting it deep down the throat. Do not administer common salt and water, since this may dilute the poison and make matters worse. After vomiting has been induced, drink plenty of lukewarm water. An enema of lukewarm, soapy water should also be given without delay. Epsom salts or Glauber salts may be used as a purgative. Under these circumstances, from a heaped teaspoonful to two level dessertspoonfuls might safely be given in a tumblerful of water. Should there be severe griping pains in the stomach, in preference to the above salts, give olive oil, castor oil, linseed oil, in a little lukewarm milk. Keep the sufferer warm, and apply heat locally to relieve pain.

Under physician's direction, 15 to 20 drops of laudanum or any household medicine containing such may be given, but, where possible, the physician should be asked over the telephone whether this may be done. To the physician's skill alone should be left the elimination of the poison in the system; injections or infusions of any subcutaneous type should only be practised by a qualified hand. Thus atropine, strychnine, digitalis, and similar stimulants have no place in other than the physician's hands. All serious consequences may be avoided by knowing your fungi and by the exercise of every care.



MUSHROOM BEDS

(Photo. courtesy C. S. Bell, Toronto, Ont.)

CHAPTER IX

MUSHROOM CULTURE

(Pl. 128)

GENERAL CONSIDERATIONS

Widespread interest in the artificial culture of varieties of the common mushroom is manifested by the numerous inquiries received every year, partly emanating from persons eager to provide themselves with a fresh and self-raised supply for the table, and partly from persons whose interest has been aroused by reading alluring accounts of financial successes obtained from growing them for profit. In our experience, failures far outnumber successes, and of all crops, mushrooms are the most difficult to grow, as well as the most uncertain. Nevertheless, given suitable conditions and with the exercise of care and perseverance, satisfactory results are attainable. Mushrooms are not infrequently grown successfully on a commercial scale. Under such conditions it has become a specialty, the success of which depends not altogether upon extensive and systematic methods employed, but very largely upon the suitability of the quarters used.

The amateur, for whose guidance the following directions have been prepared, is advised to proceed slowly at the start and not to engage too extensively in a project likely to prove a disappointment unless the fundamentally important facilities are available.

SUITABLE QUARTERS AND CONTROL OF TEMPERATURE AND MOISTURE

The cultivation of mushrooms out-of-doors in Canada cannot be recommended. Occasionally one's efforts may yield a number of specimens, but evidently this is more the exception than the rule. In some other countries climatic conditions are favourable enough to make this method quite a success.

Since mushrooms do not require light, their artificial culture, as far as the amateur is concerned, will be confined, for this and reasons of convenience, to cellars either below a dwelling, or of the kind used for storing roots, and to other similar quarters. It may be mentioned that the fall of the year is considered the most suitable time.

The fundamental requirements are the facilities with which the requisite temperature and degree of moisture may be maintained and controlled in any such chosen place. For this reason preference should be given to quarters where the least difficulties in this regard are likely to arise. Above all, the first condition for success is the keeping of temperature and moisture at a uniform level. Nothing seems more disturbing than sudden drops in temperature or the absence of a system of ventilation preventing the regulation of moisture in air and bed.

Granted these essentials, it can be understood that any premises, either specially built, or already available, will suit our purpose.

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MANURE, THE MEDIUM FOR ARTIFICIAL CULTURE

Notwithstanding the fact that in nature mushrooms grow on all kinds of soil, for the preparation of beds for artificial culture, stable manure is the only suitable medium. This manure must be carefully prepared for the purpose. Wood shavings as used in some stables are better avoided by the amateur. The type of manure required should be selected with care if success is to come from the venture. Manure piled for a long time out-of-doors and exposed to rain, is impoverished; manure containing too much straw or the "droppings" alone is unsuitable. Fresh manure, preferably from a horse-stable, has given the best results after preparation.

CURING OF MANURE

For this purpose clear the stalls daily and pile the manure under cover on the floor, to a height of four to five feet. Avoid mixing long and dry straw with the manure, which should be moderately moist. The pile should be left to ferment undisturbed for about five days; then it should be turned over at intervals of from three to four days, taking care to shake out and remove at each operation any long straw. During the process of turning, pay attention to the moisture content; the manure should never dry out and never be too moist. It should not form lumps or balls that retain their shape under pressure. If too dry, moisten with a little water; if too wet, turn over several times in succession to reduce moisture. During the curing operation manure must not be exposed to freezing. Frost stops the necessary fermentation. Summer's heat equally interferes with the process of proper curing.

It will be seen that considerable manipulation of the manure is required; the proper condition is usually obtained after some experience.

Dry manure will spoil by burning during fermentation—manifested by the turning ashy grey of the burned portions. Spontaneous combustion is very unlikely to occur.

Wet manure will become inactive as regards fermentation, but the process is bound to set in any time the right degree of moisture is re-established. Since this may be after the manure is moved to the beds and planted, one can imagine the results. There will be no mushrooms, even though the best of spawn has been planted.

Providing all untoward conditions have been successfully avoided, the manure will have lost most of its strong odour, it will no longer steam vigorously, and its texture will be uniform as well as its colour, which should be chocolate brown. It will be of a flaky nature, easily passing through the fingers, and yet not by any means dry. Above all, the temperature of the pile has become moderate as well as uniform. Once this mechanical condition and colour has been attained, and once the temperature of the pile is evenly some 100 to 130° F., the process of curing has been completed.

For safety's sake the pile may be left for two more days, during which the temperature should not materially rise or fall. Thereafter it may be transferred to the beds.

THE MUSHROOM BEDS

These may be situated either on the cellar floor or be arranged in series of shelf-like tiers one above the other along the sides of the walls. A single bed may be some three feet wide,

more or less. The width is immaterial and simply a matter of convenience; equally so is the distance of one tier above the other.

It is not necessary, but more convenient, to enclose the beds in a wooden framework of inch boards about ten inches high. On concrete floors it is preferable to provide a wooden bottom to the beds. Any rough boards will suffice. Earth bottoms have the advantage over cement or bricked flooring, of retaining and regulating moisture more readily. The cured manure may now be transferred to the framework of the beds. It should be spread in a layer about three inches thick, avoiding lumps, over the bottom. Then by means of a brick it should be gently pounded to form a compact layer. Keep on adding other layers, pounding them down until the bed is about ten inches deep. Unless well compacted the beds will quickly dry out, and artificial watering is not easy. The manure should always be kept uniformly moist in the beds. When squeezing it firmly with the hand, water should never drop away, yet the feeling should be one of moisture. If too dry, sprinkle the surface of the bed with lukewarm water; small amounts at repeated intervals are better than one copious soaking. After this stage has been reached, the manure should properly warm up slightly and evenly. If no increase in temperature takes place, there is the possibility that failure will result. At some stage or other there must have occurred an error, which is now difficult to correct. The manure may be too wet, and compacted in consequence too firmly; or it may have been too dry. When no warmth develops, the cause had better be ascertained and the bed loosened with a fork, left for twenty-four hours if too wet, or moistened if too dry, and then pressed down again. This will often restore activity.

Providing the temperature of the beds has declined to about 65° F., "spawning" or planting may be proceeded with.

SPAWN AND SPAWNING THE BEDS

About this time the surface of the bed may show the growth of moulds and common manure fungi. These constitute no obstacle and will quickly pass away.

The term "spawn" has become familiar to our readers. The spawn is taken from vigorously growing beds or from artificial cultures of the varieties of the common mushroom usually grown. In order to preserve this spawn it is usually mixed with specially rich manure and pressed into brick forms. These are afforded a period of incubation, during which the spawn permeates the substance of the brick more or less profusely. The brick shapes are then dried, and most commonly it is in this shape and form mushroom spawn is sold to the public. There exists a far more superior kind of spawn, and that is known as "pure-culture spawn," nowadays obtainable from most dealers. This often comes in sterile containers, and is usually in a fresh and growing condition. The principle of spawning is simply the transfer of portions of the commercial products containing the spawn to the beds. This is done by breaking the bricks into small pieces of about the size of a fifty cent piece and half an inch thick, or by the use of pure-culture spawn in small quantities, and placing the individual portions about nine inches apart each way and at the depth of one inch, all over the surface of the bed.

When the spawn has been distributed, level the surface of the bed, press down once more and let it rest undistrubed for a week to ten days. Any kind of growth showing before this lapse of time is likely not due to the spawn. About this time, if everything goes well, one many

observe the mycelium growing from the spawn. It consists of rather strong, creamy-white strands, and must not be confused with the delicate and fuzzy growth of mould so often appearing from dead spawn portions. When seen once, there is no mistaking the proper spawn development. If such has been going on vigorously for a few days, one should now gently cover the beds with a layer about one inch in thickness of rich, medium-moist compost or good garden soil, preferably of a loamy nature. Do not press down this soil casing or dressing.

TEMPERATURE AND MOISTURE CONTROL

In from six to eight weeks, mushrooms will appear if success is to be ours. All the time our greatest concern should have been proper moisture conditions of the beds. Too much ventilation will dry out the beds; the reverse will make them cold and wet. To both, mushrooms remain strongly impassive.

Sometimes the surface alone is dry and the bottom wet, a common occurrence when the bed is on a concrete floor, so a very gentle sprinkle will suffice to establish the proper equilibrium. Before giving water, always make sure the bed requires it. Keep the floors moist, especially if the beds are on earth bottom. This will often suffice with a very occasional surface sprinkling. If the whole bed is too dry, apply lukewarm water in small quantities at about six-hour intervals until the bed appears just properly medium moist. Once mushrooms appear, water may be more freely given, but always in small quantities only.

What has been said about the proper temperature and moisture conditions of the beds is equally applicable as well as equally important to the surrounding air. It is obvious that rapid changes in the temperature of the air will affect the moisture content of the beds. If it be too low, the beds will become wet and cold; if too high, the opposite will result. This is one of the most essential and fundamental conditions for the success of our venture.

Uniform air temperature above all things is now important. The maintenance of this is largely a matter of ventilation. Even air temperatures in the mushroom cellar really means even moisture content. The most useful temperature is that remaining within 50-60° F.

If ten weeks after spawning no mushrooms appear, the venture has usually been a failure, and a careful analysis of previous procedure is necessary, with a view towards improving our methods the next time.

A bed in full bearing will keep on yielding good returns for some two to four months, but be prepared for a shorter time. When exhausted, remove the manure, which should not be used a second time. It will come in very useful in one's garden. Whatever quarters have been used should be thoroughly cleaned out; and the framework of the beds sprayed with formaldehyde or similarly effective but temporary disinfectants.

DISEASES AND INSECT PESTS

Mushroom culture, being usually carried on in dark places, is frequently jeopardized by a lack of cleanliness of beds and premises. Rather unusual care is essential, otherwise fungous diseases or insect pests are bound to appear, and all efforts are then doomed to failure. Among

these troubles perhaps that caused by the parasitic fungus *Mycogone perniciosa* is the most common and destructive. Its presence is often revealed by a most offensive odour, and on hunting for the cause of this, there will be found, especially among the younger stages, decaying and often malformed "buttons" and young mushrooms that have turned into a putrid mass. Immediately such specimens have been discovered they should be removed very carefully, and no sound specimen should be touched by hand or implement when removing diseased ones. These should be placed in a paper bag and burned at once. Wherever removed from the bed it is suggested that a handful of unslaked lime be scattered over the surface of the affected patch and its immediate surrounding. A careful daily examination, repeating this treatment when new specimens are found affected, is absolutely essential, since the progress of the disease is rapid under favourable conditions for mushroom culture. It is hardly necessary to emphasize the fact that once an affected crop has been produced, the entire premises should be very thoroughly sterilized and cleansed. The use of formalin or sulphate of copper in solution, followed by flushing with water, is recommended.

Other diseases caused by fungi and bacteria have been recorded, but, generally speaking, the treatment suggested will answer in all cases. Prevention is always more satisfactory than treatment and doubtful cure.

In some mushroom-beds much damage is done by insects. Flies of various kinds are not uncommon. Their maggots cause the real injury, and worm-eaten specimens result. Hence care should be taken to prevent an attack by occasional fumigation with sulphur or tobacco, which is simple and effective. It might be advisable to try out some of the newer substances commonly advertised, as some of them are no doubt highly effective for the control of the common house-fly, which, by the way, does not deposit its eggs on or in mushrooms. The flies under consideration are usually very much smaller in size. More annoying than destructive are all kinds of mites—especially a little reddish-brown one—very minute, sluggish or more rapidly-moving creatures that will crawl all over the premises and beyond. "Springtails" may also be mentioned in this class. Their control is difficult; unslaked lime, pyrethrum powder, or tanglefoot papers might be resorted to. Wood lice or sow bugs are very common and often will feed on mushrooms. They may be trapped by tanglefoot papers or caught underneath hollowed out, halved potatoes distributed at intervals throughout the beds. Some authors recommend the use of poison bait, consisting of bran or oatmeal thoroughly mixed with molasses or sugar water, and to which Paris green or potassium bichromate about one-half teaspoonful to a pailful of bait has been added.

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APPENDIX

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COMBINED GLOSSARY OF TECHNICAL TERMS AND LIST OF ILLUSTRATIONS

NOTE.—Since some of the botanical terms have a very particular meaning as applied to the study of fungi, reference is made in most instances to illustrations which show these characters.

adpressed, lying flat against each other (gills), or closely to the surface (scales, etc.).
anastomosis in fungi, the joining in a net-like manner of the gills or pores (Pls. 78; 99).
annulus, ring on the stem of a mushroom (Pls. 14; 15; 81[1]).
apex, the tip of an organ.
apical, relating to the apex.
Ascomycetes, types of (Pls. 120-127).
ascus (pl. asci), single sac-like organ in which spores are produced (Pl. 4S).
basidium (pl. basidia), club-shaped organ at the apex of which spores are borne (Pl. 4R).
Bird-nest fungi, type of (Pl. 119).
button-stage, in mushroom (Pl. 80); in Lepiota (Pl. 9).
caespitose, closely associated (Pls. 11; 24; 56[2]).
cap, the spore-bearing portion of a fungus.
— campanulate, bell-shaped (Pl. 56[2]).
— conical (Pl. 46[1]).
— convex (Pls. 25; 41; 70).
— convolute, resembling coils of brain (Pl. 122).
— coriaceous, leathery.
— cup-shaped (Pl. 126).
— cylindrical (Pl. 86[2]).
— depressed in centre (Pl. 34; 67).
— disk-like (Pl. 125).
— excentric (Pl. 77).
— fan-shaped (Pls. 60; 48).
— floccose (Pl. 33).
— folded in two lobes (Pls. 123; 124).
— funnel-shaped (Pls. 4Y; 22[2]).
— furrowed (Pl. 88).
— gnarled (Pl. 122).
— goblet-shaped (Pl. 127).
— hemispherical (Pls. 42; 84[1]).
— honeycombed (Pls. 120; 121).
— infundibuliform, *see* funnel-shaped.
— lobed (Pl. 60).
— nearly plane (Pl. 24).
— overlapping like shingles (Pl. 58).
— partially expanded (Pl. 72).
— pitted (Pls. 120; 121).
— reflexed, turned or bent back.
— resupinate, attached at the back (Pl. 68).
— saucer-shaped (Pl. 126).
— sessile, having no stipe or stalk (Pl. 49).
— shell-shaped (Pl. 48).
— striate, having parallel or radiating lines or markings (Cap: Pl. 88).
— subumbonate (Pl. 86[1]).
— surface cracking (Pl. 44).
— — — into areas (Pl. 90).
— — — net-like (Pl. 89[2]).
— — hairy, coarsely (Pl. 60).
— — — finely (Pl. 56[2]).
— — — stiffly (Pl. 68).
— — mottled (Pl. 67).
— — scaly (Pl. 59).
— — wrinkled (Pls. 51[2]; 54; 64; 89[1]).
— — zoned concentrically (Pl. 29[2]).
— tomentose, *see* hairy.
— umbilicate, centrally depressed (Pl. 52).
— umbonate, centrally elevated (Pls. 4U; 12).
chlorophyll, the green colouring matter of plants.
confluent, merging into.
Coral fungi, type of (Pl. 106).
cortex, the bark or rind.
cuticle, the outermost skin.
deliquesce, becoming liquid.
Earth star fungi, types of (Pls. 111; 112).
egg-stage, in Amanita (Pls. 5[1]; 7[1]).
— in Gasteromycetes (Pls. 110[1]; 110[2]).
— section through, of Amanita (Pl. 5[2]).
— section through, of Dictyophora (Pl. 110[2]).
ferruginous, rust coloured.
fibril, a small fibre.
Gasteromycetes, types of (Pls. 109; 111; 113; 115[1]; 119).
genus (pl. genera), the name given a group of a number of species having common characteristics.
gill fungi, type of (Pl. 14).
gills, radiating, knife-like folds composing lower surface of cap in gill fungi.
— adnate, joined squarely to stem (Pls. 4Z; 19; 70).
— adnexed, attached to the stem but not by full width (Pls. 4X; 52).
— attached, *see* adnate.
— attachment of, to stem (Pl. 4 U-Z).
— broad (Pls. 20; 53[1]).
— close (Pls. 17; 78).
— crowded (Pls. 25; 32[2]).
— decurrent, continued down the stem (Pls. 4Y; 4V; 22[2]; 45).
— dentate, toothed.
— distant (Pls. 26; 30).
— eroded, ragged, torn edged (Pl. 48).
— even (Pl. 4XA).
— forked at base (Pl. 77).
— free (Pls. 4U; 80).
— intravenose, veined within spaces.
— milky juice exuding (Pl. 35).
— narrow in breadth (Pls. 30; 32[2]).
— net-like at apex of stem (Pl. 78).
— notched, nicked at point touching stem.
— section through, magn. (Pl. 4Q).
— serrate, with saw-like teeth.
— sinuate, *see* notched (Pls. 4W; 17).
— ventricose, broader in the middle (Gills: Pls. 4XB; 10).

gleba, spore-bearing tissue in certain fungi (Gasteromycetes) (Pl. 110).
globose, globular (Pl. 115).
gregarious, growing in colonies.
habitat, natural abode.
hygrophanous, appearing watery.
hymenium, layer of spore-bearing cells in fungi.
— in Ascomycetes (Pl. 4S).
— in Basidiomycetes (Pl. 4R).
hyphae, hair-like, single component of mycelium (Pl. 4A).
Jelly fungi, type of (Pl. 108).
margin, the edge of the cap in fungi.
— acute, relating to the sharp terminations of margins of gills (Pl. 52).
— appendiculate, small fragmentary appendages (Pl. 69).
— extending beyond gills (Pl. 62^1).
— involute, rolled inwards, incurved (Pls. 34; 78).
— obtuse, rounded or blunt (Pls. 4W; 91).
— repand, wavy (Pl. 76).
— splitting (Pls. 21; 74^2).
— striate (Pls. 5^4; 5^6; 8; 40).
— undulate, wavy (Pl. 65).
— wavy, *see* undulate.
membranous, skin-like.
mushroom, type of gill-bearing (Pl. 4P).
— button-stage of, *see* buttons.
— cultivated (Pl. 128).
mycelium, vegtative portion of a fungus, root-like in function (Pls. 3^5; 4A).
ochraceous, ochre in colour.
ovate, ovoid, egg-shaped (Pls. 5^1; 7^1; 110^1; 110^2).
pellicle, cuticle.
peridiola, small fruiting bodies as in Bird-nest fungi (Pl. 119X).
peridium, the outer covering of certain types of fruiting bodies (Puffballs).
pore fungi, type of (Pls. 4T; 91).
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— — showing pore layer separating from cap (Pl. 4*).
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ring, *see* annulus.
— disk-like (Pl. 14).
— inferior, below middle of stem.
— pendulous, hanging downward (Pl. 81^1).
— superior, above middle of stem (Pl. 13; 15).
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scales, bran-like (Pl. 11).
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— in Lepiota (Pl. 9).
— minute (Pl. 18).
sclerotia, specialized resting bodies of fungi.
— of Ergot fungus (Pl. 3^2).
— underground (Pl. 3^1).
seed, of garden pea for comparison with fungus spores (Pl. 4B).
spawn, *see* mycelium.
species, the name given individuals of common characteristics belonging to one genus.
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— germination of (Pl. 4L-O).
— of various fungi, uniformly magn. (Pl. 4C-K).
— "prints" of fungus (Pl. 3^3).
sporophore, spore-bearing organ.
stem, the portion supporting the cap.
— apex, the portion closest to the cap.
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— — swollen (Pl. 17).
— bulbous (Pl. 6; 14; 15).
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— central (Pl. 15).
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— downy, woolly (Pl. 29^1).
— flexuous, turned, twisted.
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— fusing (Pl. 58).
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— pruinose, covered with a bloom or powder, appearing frosted (Pl. 65).
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— tapering towards base (Pl. 42).
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— velvety (Pl. 53^2).
— ventricose (Pl. 92).
— zoned (Pl. 73^2).
teeth fungi, types of (Pls. 103; 104).
tubes, the pores in pore fungi.
— forming a network (Pl. 99).
veil, a covering stretched from stem to margin of cap, later detached (Pls. 7^2; 73^2).
— cobwebby (Pl. 73^2).
— covering gills entirely (Pl. 7^2).
volva, the covering, at first wholly enclosing certain fungi, later torn apart, with the lower half remaining cup-like at the base of stem (In Amanita: Pl. 6; 7; in Gasteromycetes: Pl. 110).
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— rupturing of, in Amanita (Pl. 5^3; 5^4).

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